

# Innovative Data-Driven Approaches to Public Health Practice



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# Objectives

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- Discuss new approaches to utilizing data in public health practice
  - D2P approach
- Data sharing
  - Health Status report/briefs
    - Infectious Diseases
    - Upcoming: maternal health
  - Zip code analysis

# Acknowledgments

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## DHHS Staff

- Dr. Chunfu Liu, Chief Epidemiologist
- Melissa Marcia, UMD School of Public Health
- Dr. Raul Cruz-Cano, UMD School of Public Health

## HHS Subcommittee

- Chair, Councilmember Leventhal
- Members: Councilmembers Berliner, Rice

# I. Data Approaches

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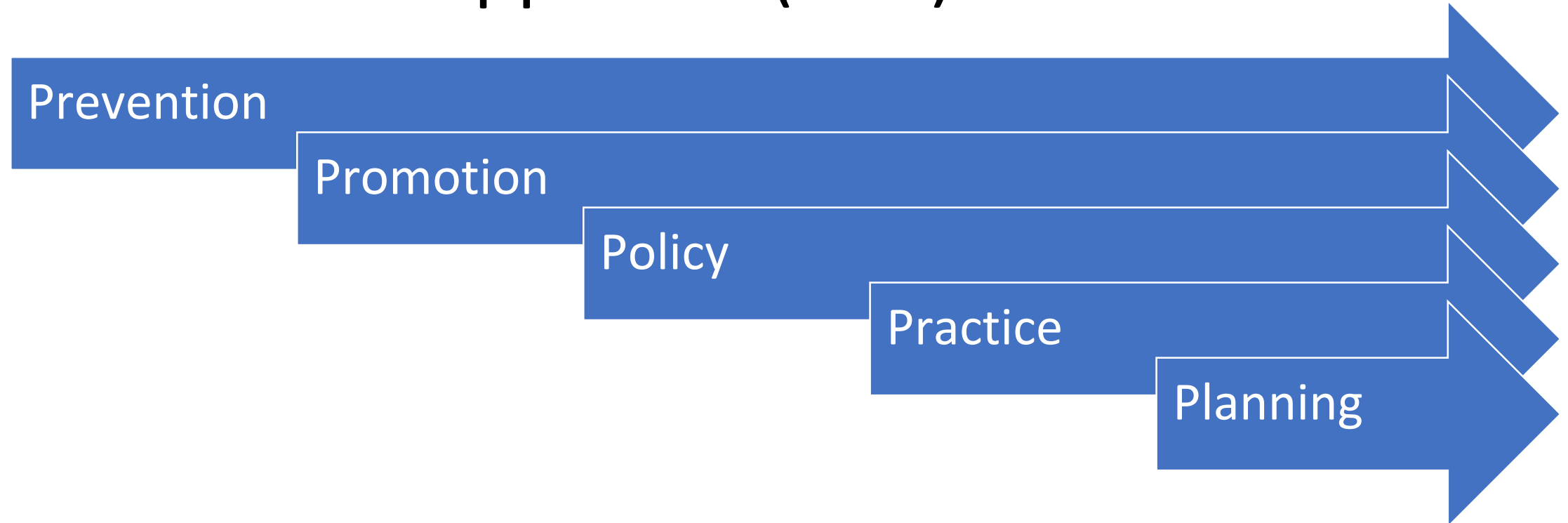


## DASH CIC-START Enables More Communities to Go "All In" to Improve Health Through Data Sharing

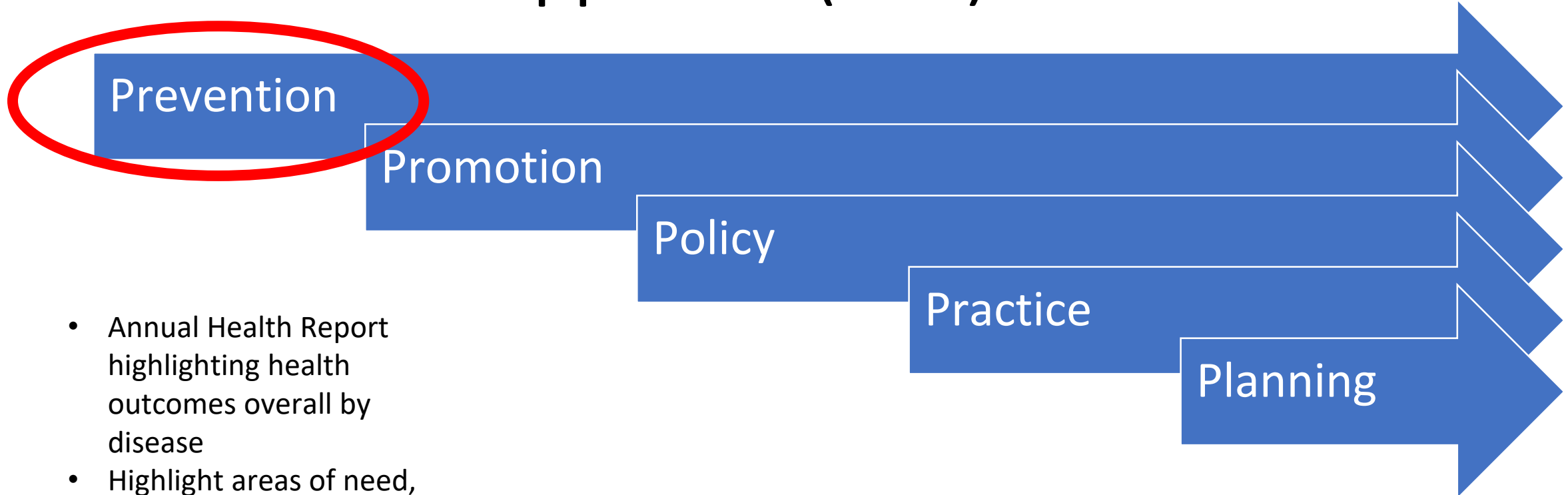
[All In: Data for Community Health](#), a learning network focused on transforming health through partnerships to share data, is actively working to help more communities make progress towards using multi-sector data to tackle community health challenges. In an effort to further support communities participating in *All In*, [Data Across Sectors for Health](#) (DASH) offered five new awards through CIC-START, a program that provides limited funds to help local leaders take meaningful

- *Montgomery County, MD: Envisioning Equity in Montgomery County, Maryland Using Data* is convening workshops with multi-sector stakeholders to develop indicators to address social and health inequities and recommend requirements for a new data sharing hub. *Led by Montgomery County Department of Health and Human Services.*

# Data-driven Approach (D2P)

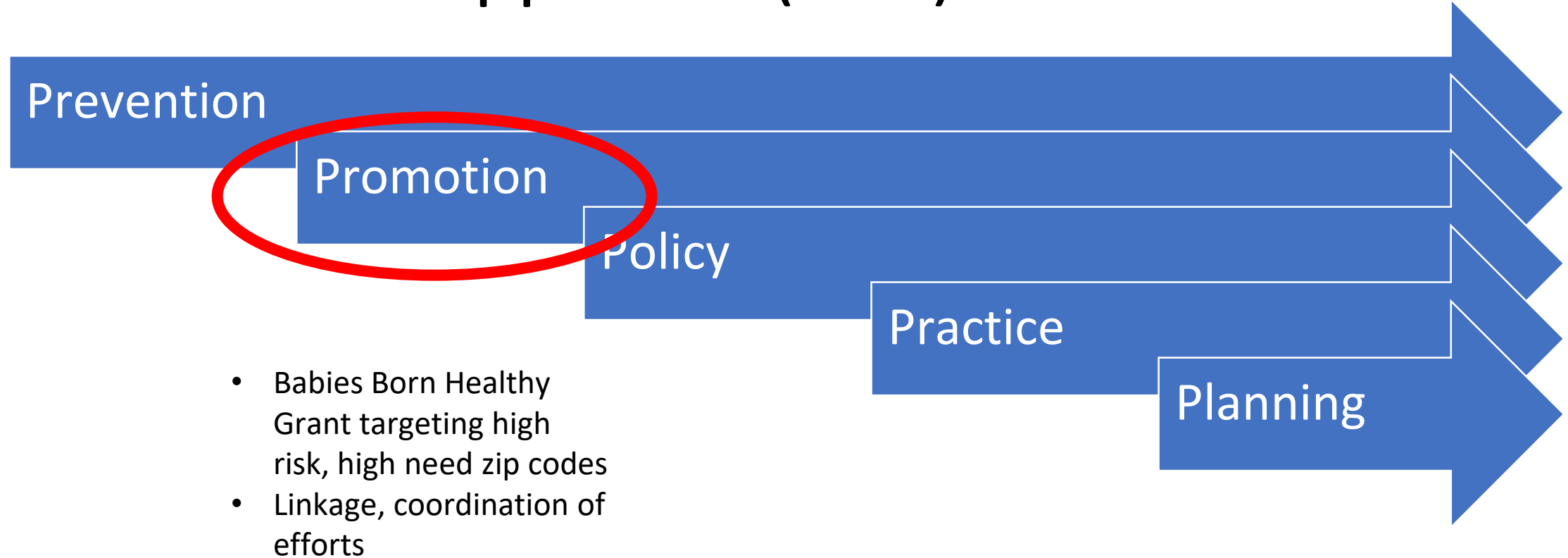


# Data-driven Approach (D2P)



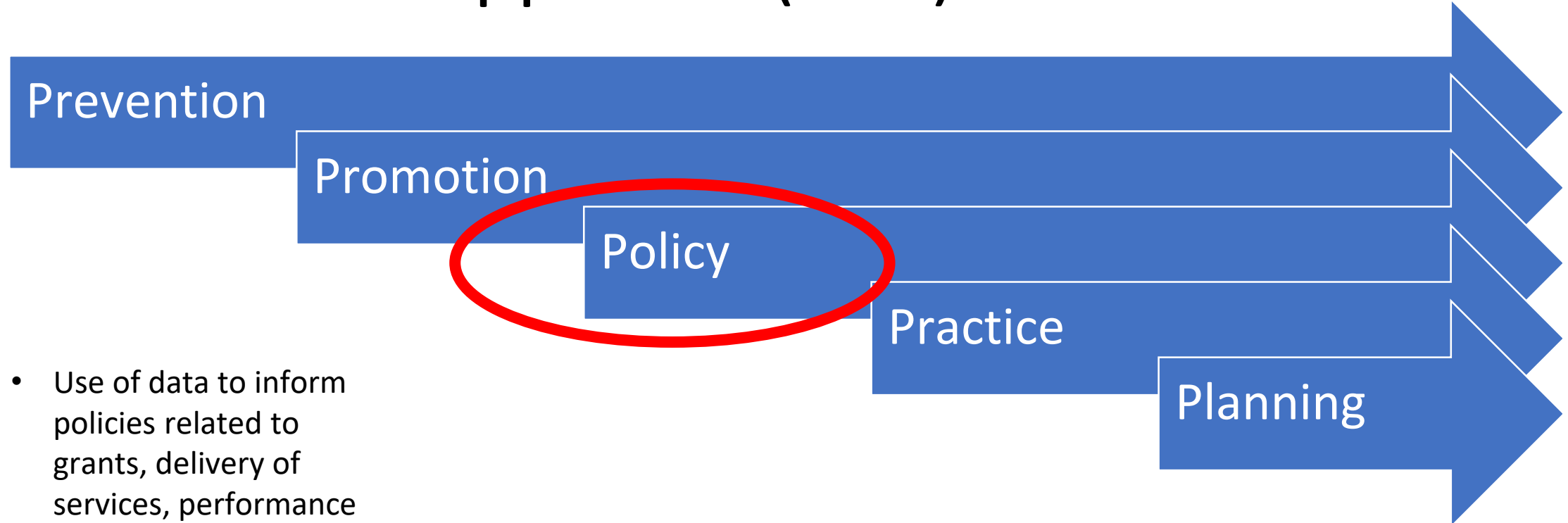
- Annual Health Report highlighting health outcomes overall by disease
- Highlight areas of need, disparities
- Target interventions to address specific needs

# Data-driven Approach (D2P)



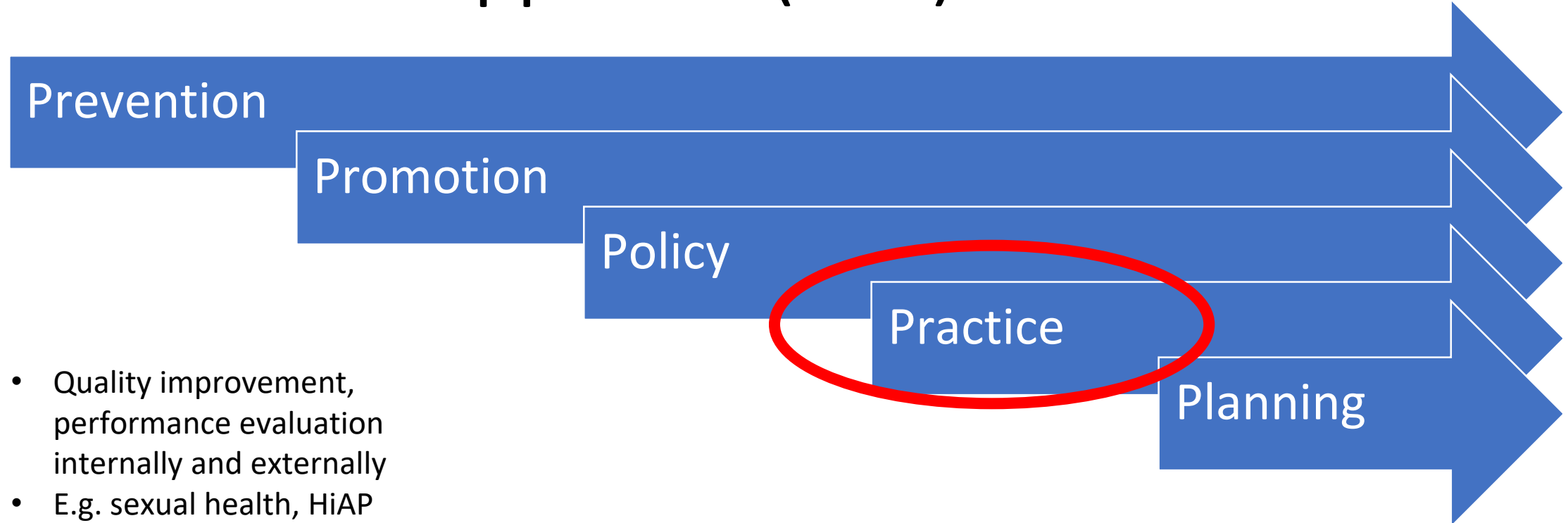


# Data-driven Approach (D2P)

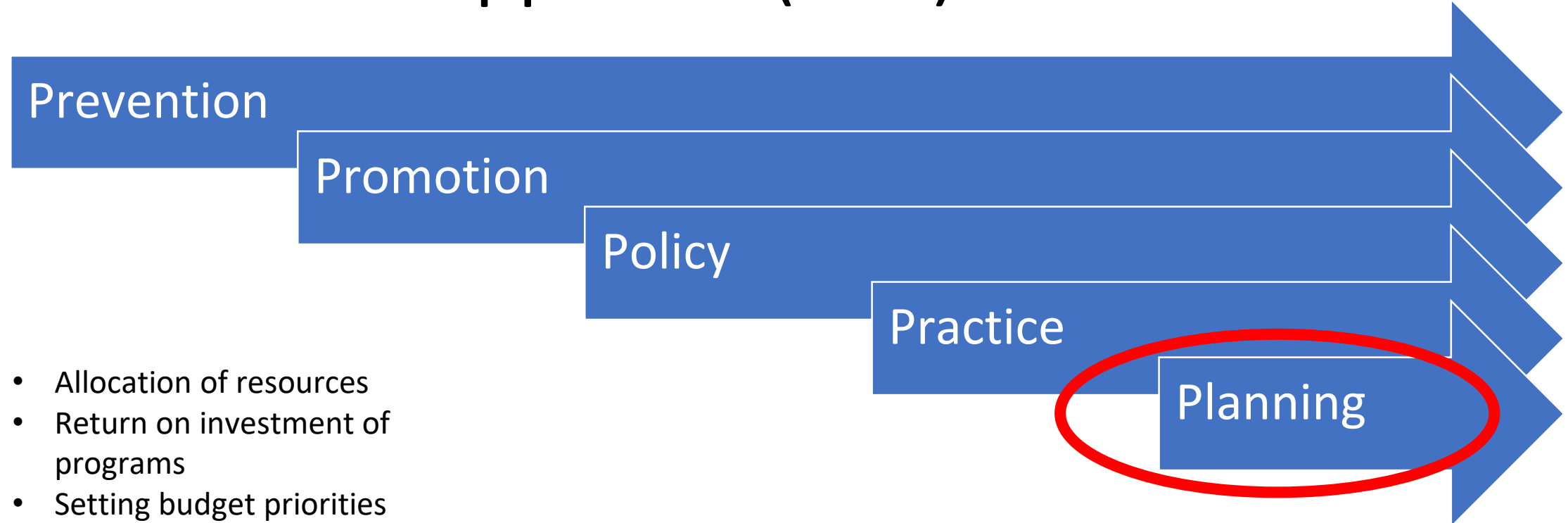


- Use of data to inform policies related to grants, delivery of services, performance measures internally and externally
- Health in all policies (HiAP)

# Data-driven Approach (D2P)



# Data-driven Approach (D2P)



- Allocation of resources
- Return on investment of programs
- Setting budget priorities
- HiAP

## II. Data Reports

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# County's First Status of Health Report

<http://www.montgomerycountymd.gov/HS/Resources/Files/Reports/PopHealthReportFINAL.pdf>

OR

Search for "population health report" in the  
search bar  
(include quotation marks)

montgomerycountymd.gov/home.aspx



MontgomeryCountyMD.GOV  
Montgomery County Government



"population health report"

Search



County Executive  
Ike Leggett

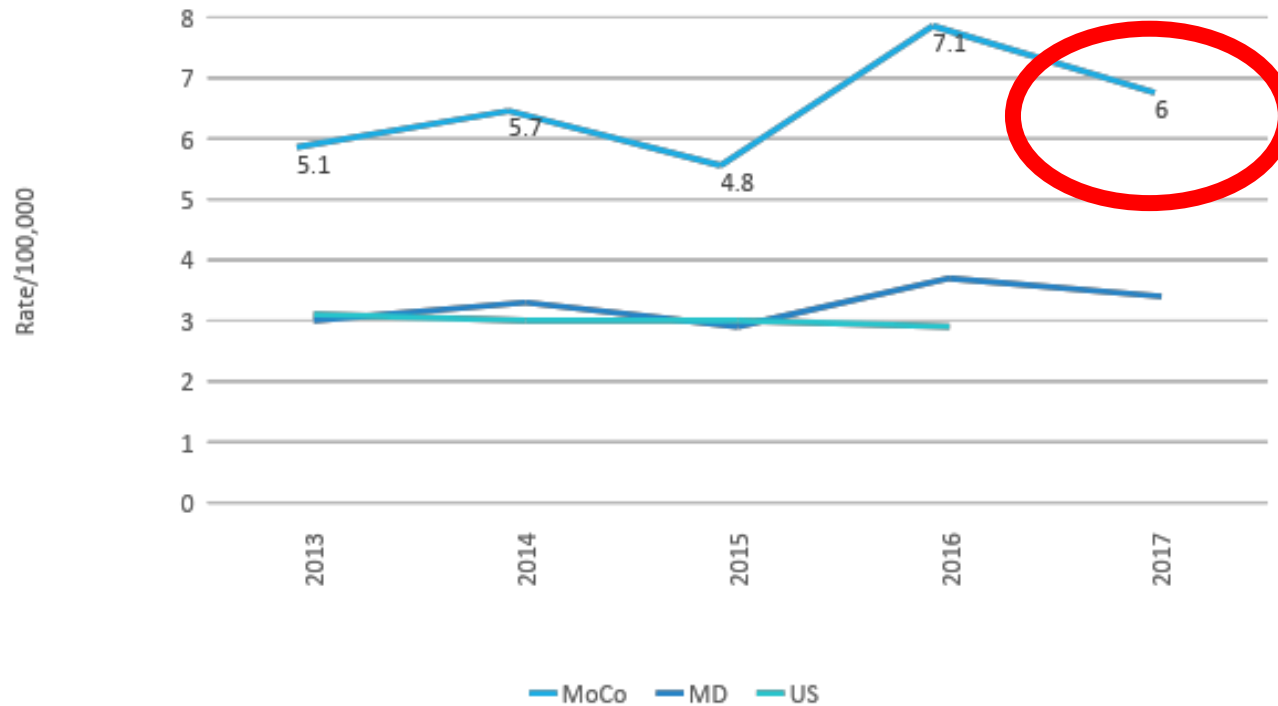
Services ▾ Residents ▾ Business ▾ Government ▾ County Executive ▾ County Council ▾ Calendar

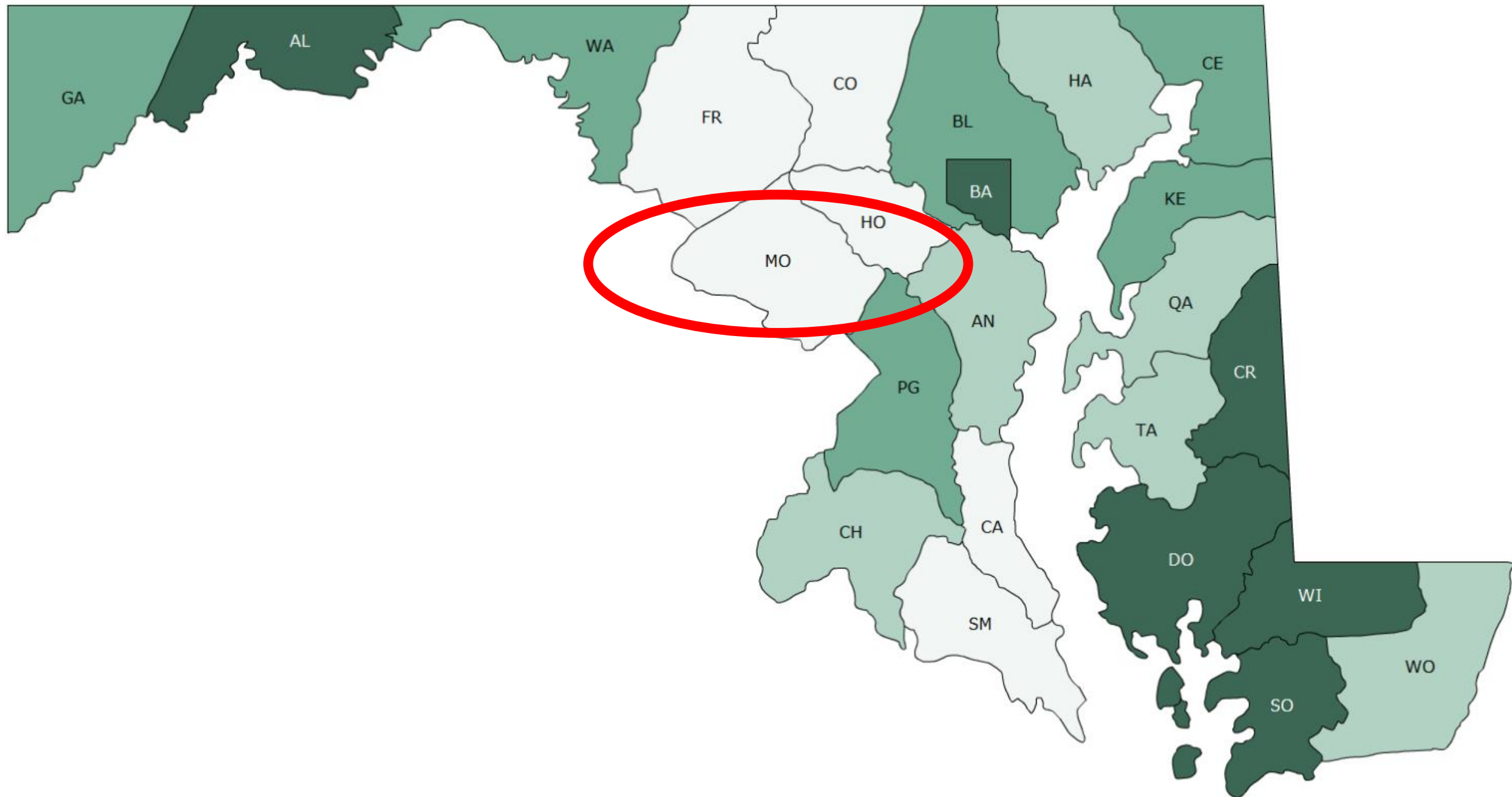
# HEALTH IN MONTGOMERY COUNTY 2008-2016

A Surveillance Report on Population Health



# Incidence Rates, Tuberculosis, Montgomery County, Maryland, and U.S.\*, 2013-17





Rank 1-6 Rank 7-12 Rank 13-18 Rank 19-24

# County Health Rankings & Roadmaps

“The annual County Health Rankings measure vital health factors [...] revealing [a] snapshot of how health is influenced by where we live, learn, work and play. They [also] provide a starting point for change in communities.”

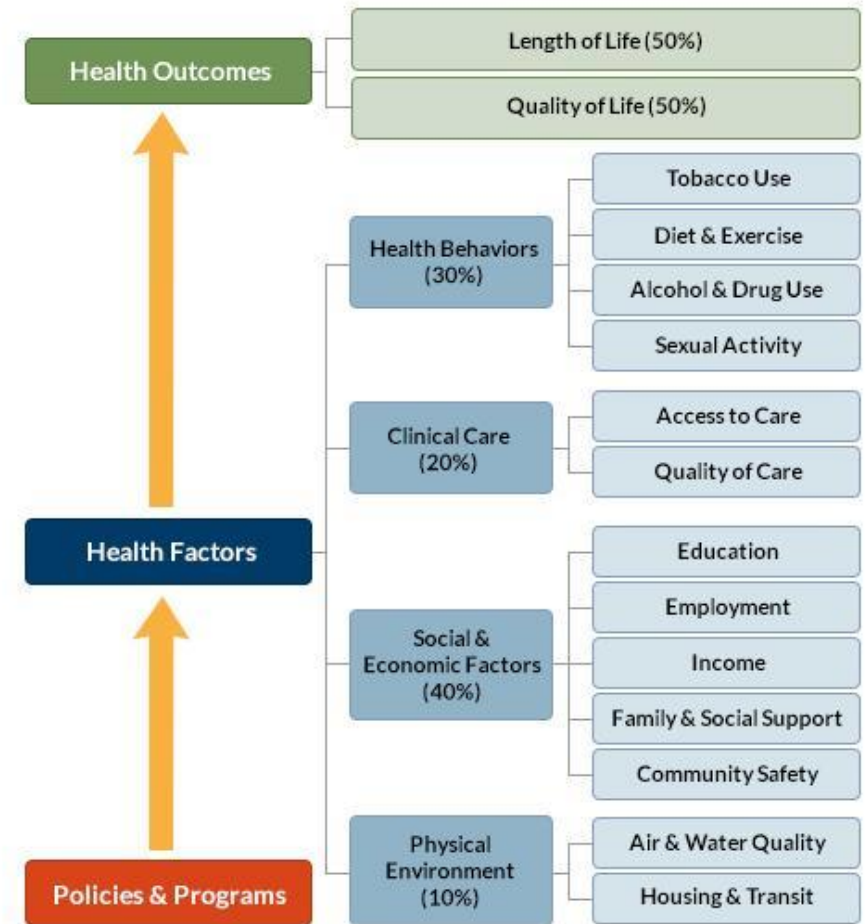


Figure 1. County Health Ranking framework/algorithm for calculating a county's rank.



- Even within a county, there can be substantial variation in health factors and outcomes.
- Most surveillance systems don't collect zip-code level data.
- Statisticians created a new algorithm using alternative data sources to rank zip codes using a framework that was still true to the original County Health Rankings algorithm.

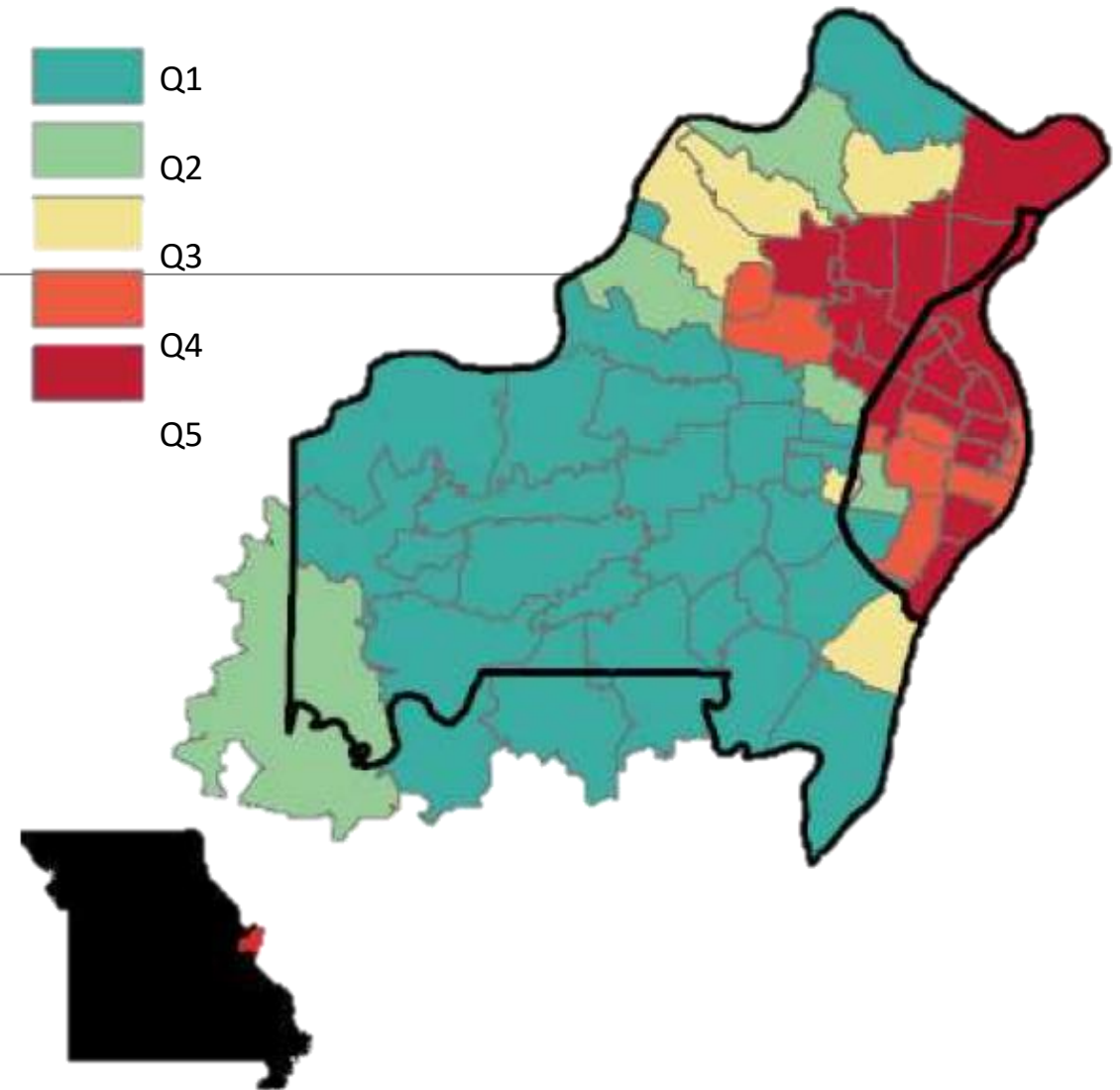


Figure 2. Subcounty Variation in Health Factors and Outcomes in St. Louis City and St. Louis County, Missouri

## Measures

- Under 75 mortality rate
- Years of productive life lost

- Inpatient and ER hospitalization rate
- Mental health hospitalization
- Low birth weight

- Sexually transmitted infection rate
- Teen birth rate

- Percent of population employed in healthcare
- After hours emergency department visits

- Population with less than a HS education
- Unemployment rate
- Childhood poverty rate
- Median household income

- Violent crime rate
- Injury death rate

## Sub-domains

Length of life

Quality of life

Health behaviors

Clinical care

Socioeconomic factors

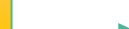
Physical environment

## Domains

Health Outcomes

Health Factors

**RANK**

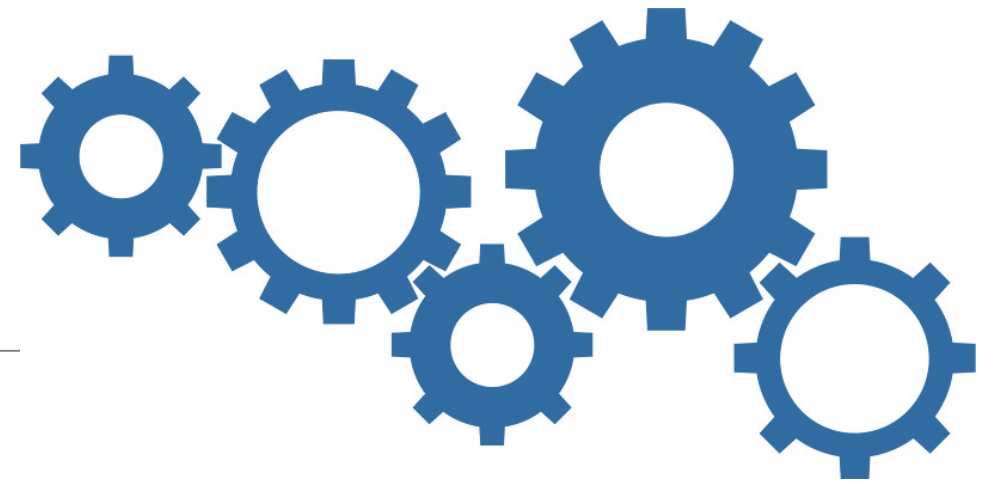


# Methods

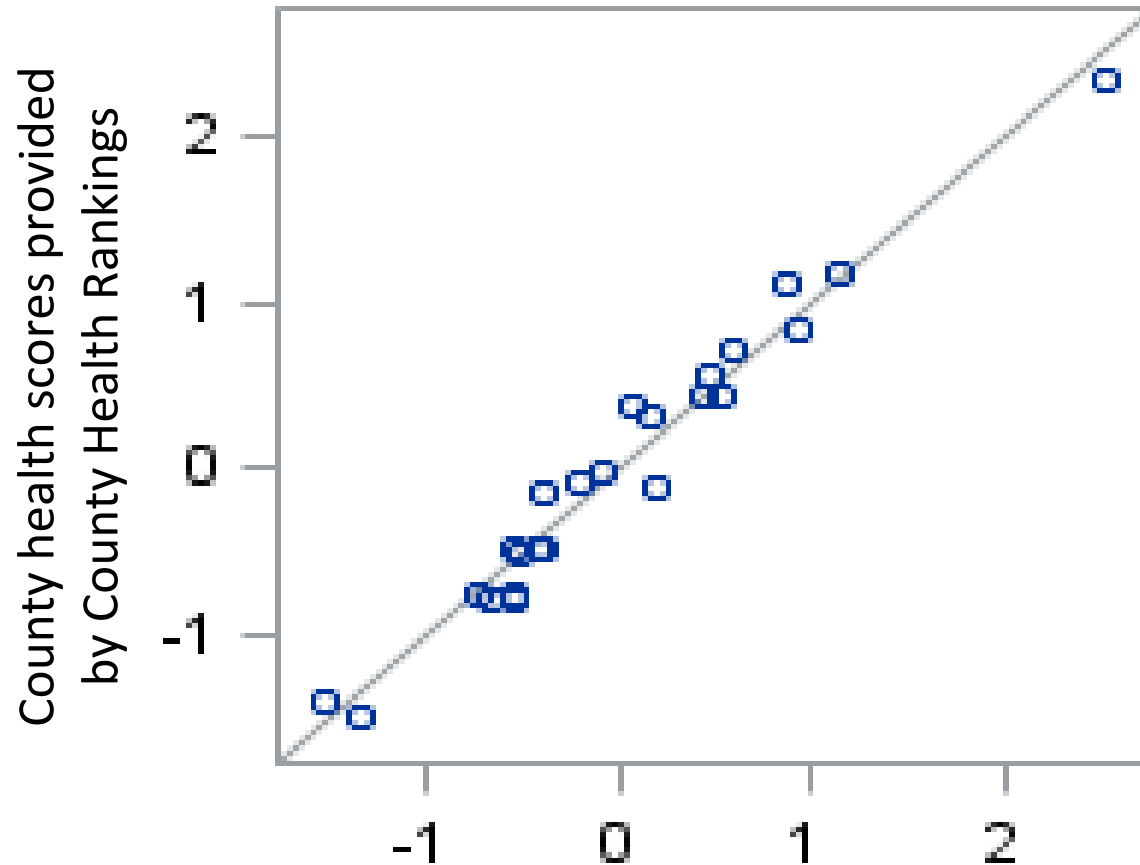
- Collected data (2014-2016) from:

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  - Birth records
  - Death records
  - PRISM
  - American Community Survey
  - In-patient and out-patient hospital records
- Used principle component analysis and multiple linear regression to derive alternative algorithm
- Compared results of alternative algorithm with County Health Rankings scores at the county level to validate model
- Applied alternative algorithm to Montgomery County zip codes



# Results—Model Accuracy



County health scores derived from alternative algorithm

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Pearson Correlation

$R = 0.983$

**Conclusion:** Our algorithm creates health outcome scores that are highly correlated with the scores provided by county health rankings. Our model is a good fit and accurately predicts the true health scores.

# Discussions

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- Follows a validated methodology provided by Nagasako et al\*.
- Secondary data analysis did not require additional data collection.
- Looks at health status holistically and considers how non-medical factors affect health
- Provides ranking results by measure, subdomain, domain, and overall that considers both health factors and health outcomes

\*Nagasako E, et al. **Measuring Subcounty Differences in Population Health Using Hospital and Census-Derived Data Sets: The Missouri ZIP Health Rankings Project.** [J Public Health Manag Pract.](#) 2018 Jul/Aug;24(4):340-349

# Sub-Domain Scores

Length of life

Quality of life

Health behaviors

Clinical care

Socioeconomic factors

Physical environment

# Length of Life

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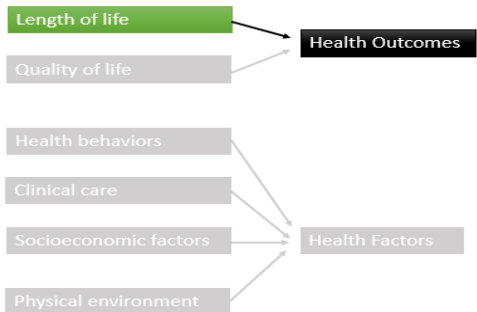
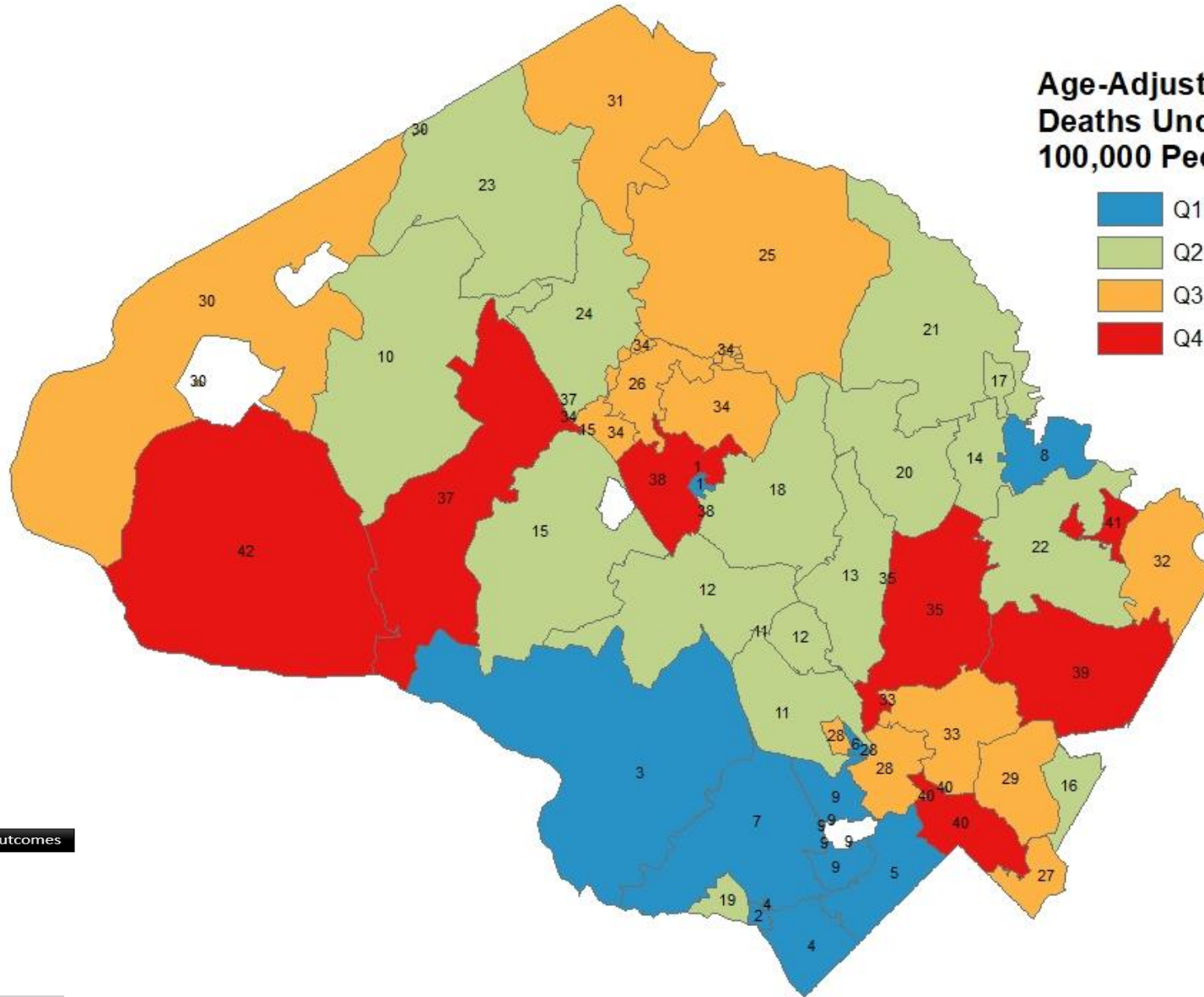
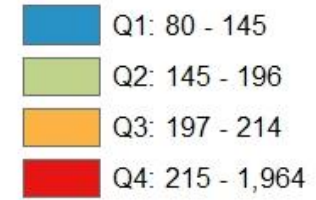
## Components:

- Age adjusted mortality
- Years of Productive Life Lost

## RWJF State Rank: #2

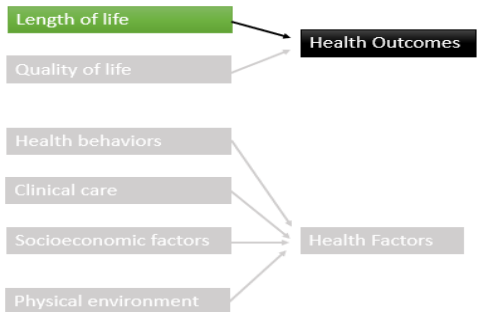
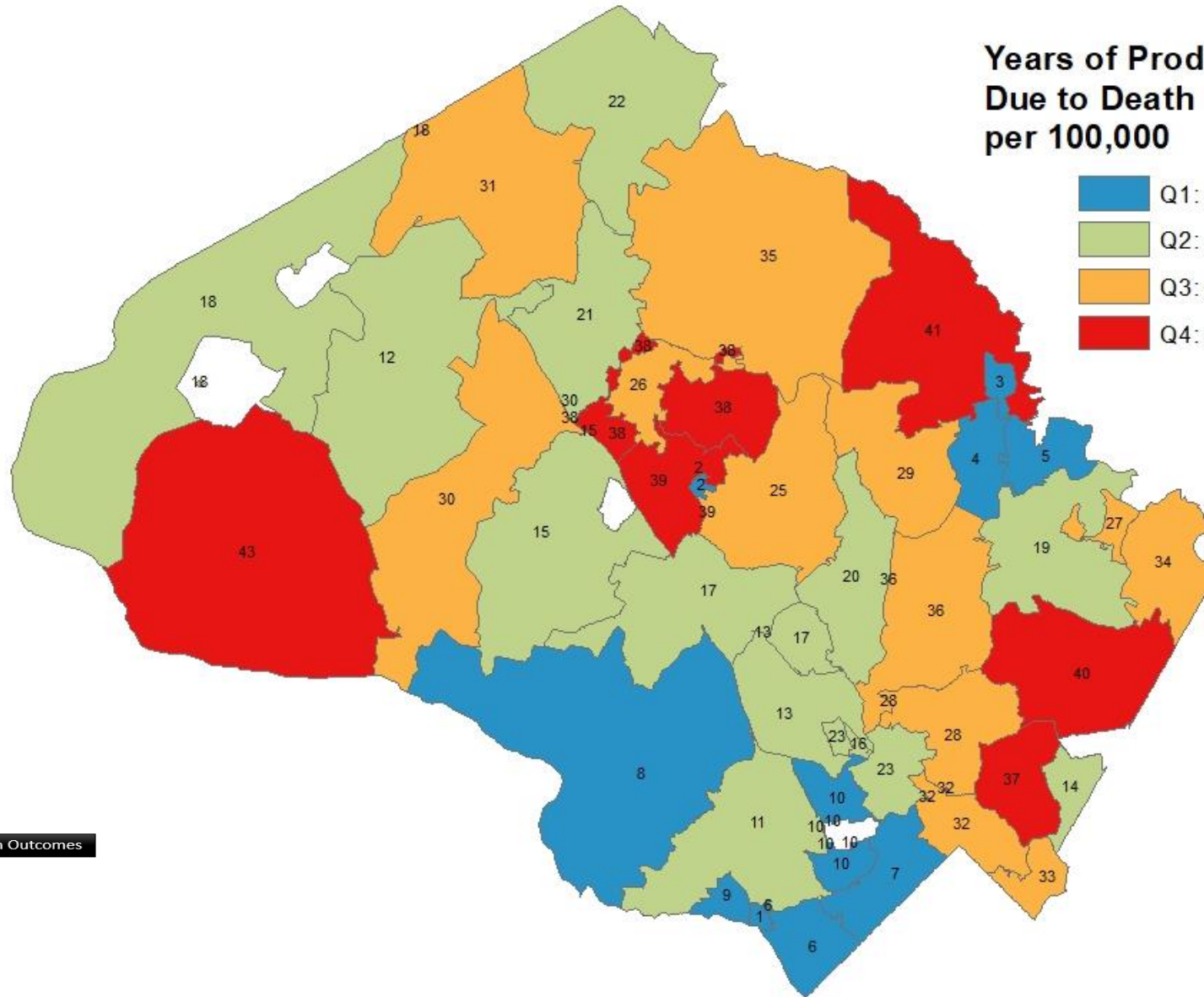
- County average: ~3500
- State average: ~6400

# Age-Adjusted Mortality: Deaths Under 75 per 100,000 People

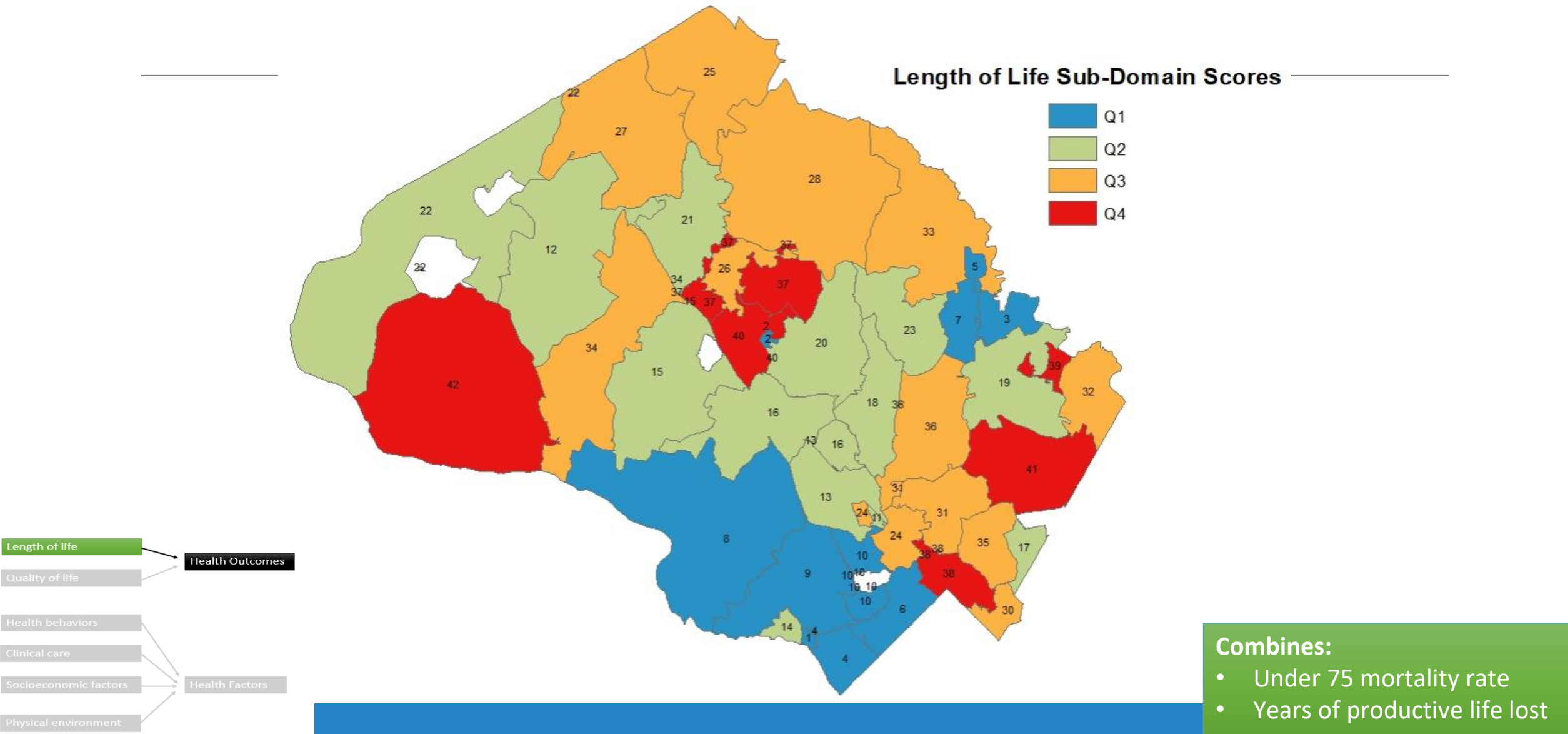




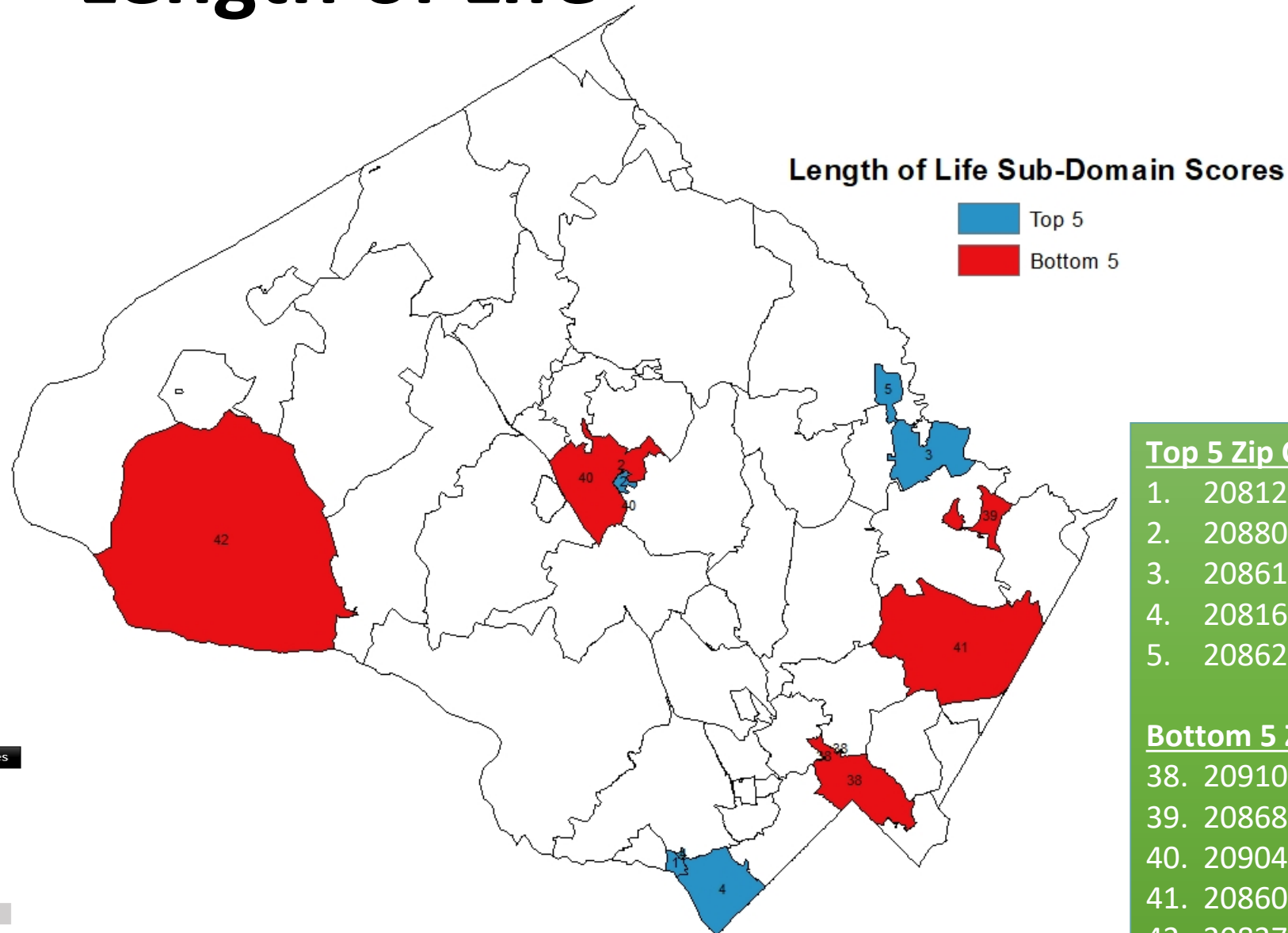
## Years of Productive Life Lost Due to Death Under Age 75 per 100,000



# Results—Length of Life



# Results—Length of Life

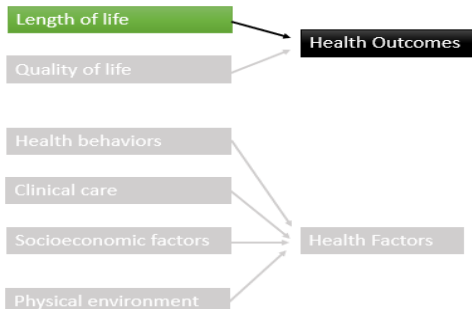


## Top 5 Zip Codes

1. 20812 - Glen Echo
2. 20880 - Washington Grove
3. 20861 - Ashton
4. 20816 - Bethesda
5. 20862 - Brinklow

## Bottom 5 Zip Codes

38. 20910 - Silver Spring
39. 20868 - Spencerville
40. 20904 - Colesville
41. 20860 - Sandy Spring
42. 20837 - Poolesville



# Quality of Life

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Components:

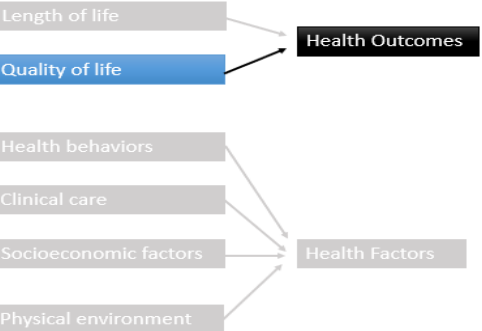
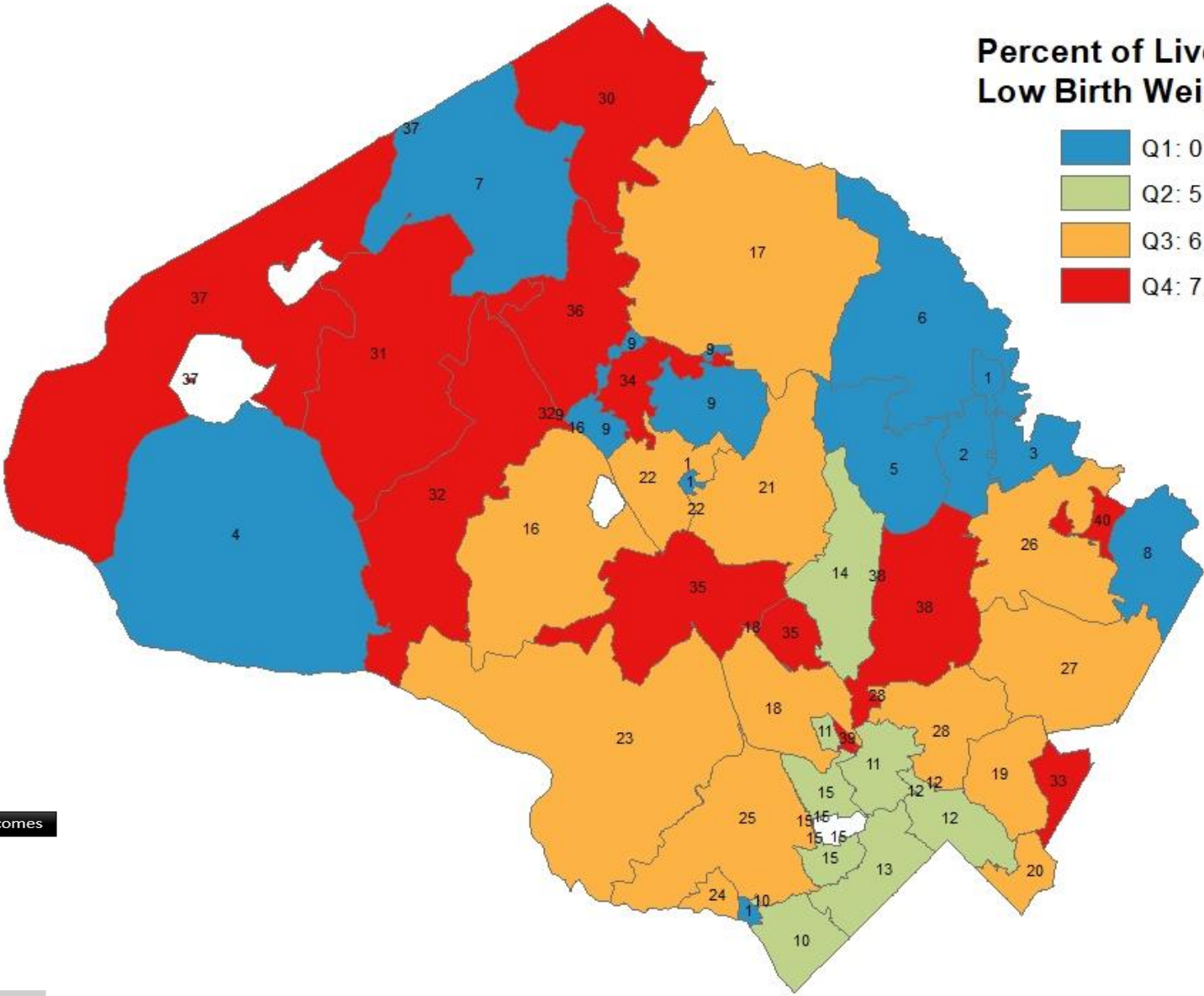
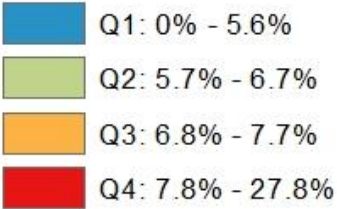
RWJF State Rank: #2

- Inpatient and ER hospitalization rate
- Mental health related hospitalization rates
- Low birth weight deliveries

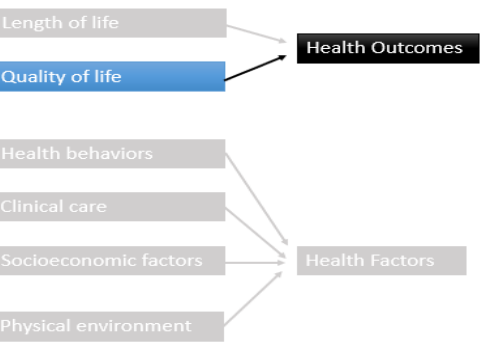
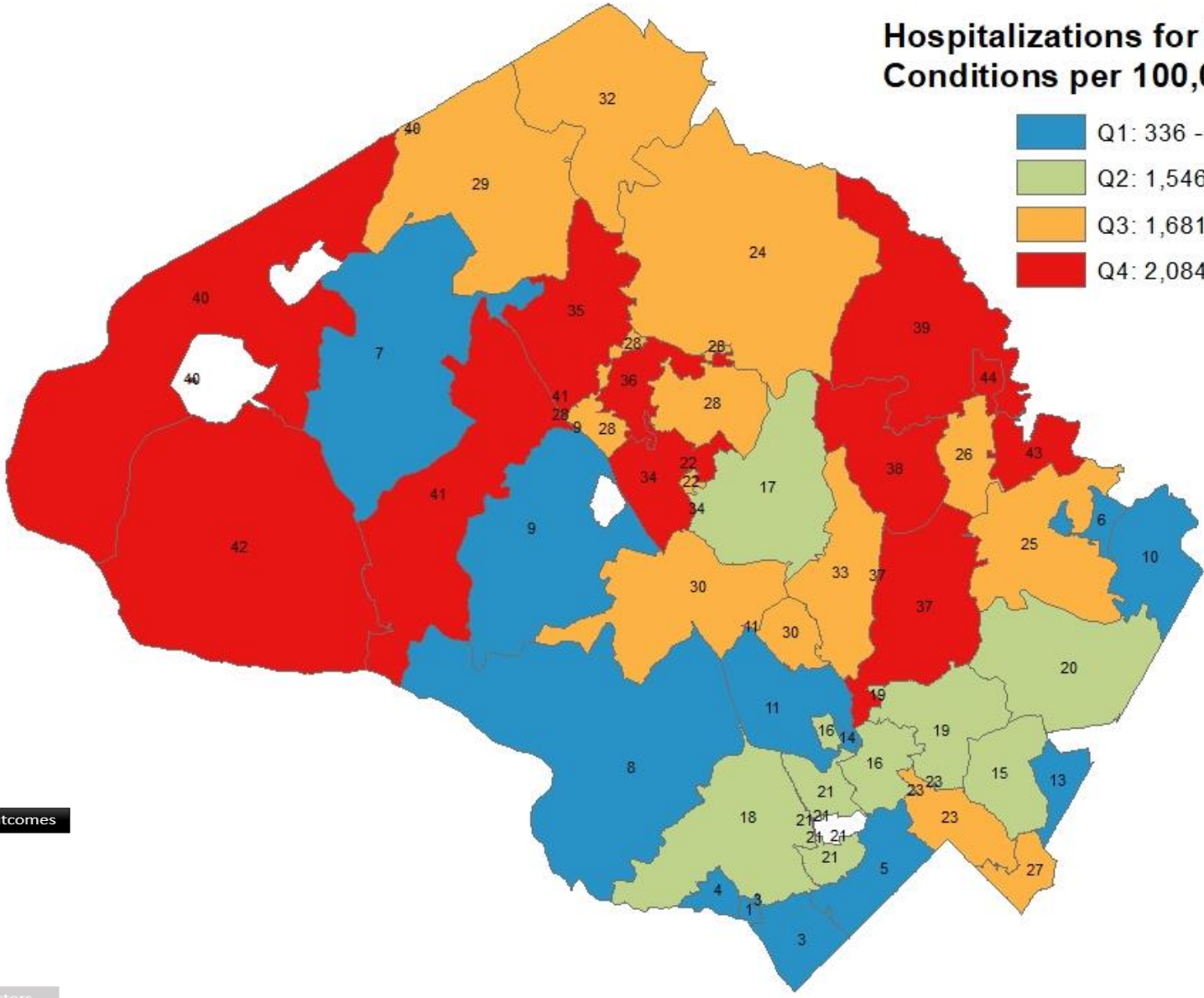




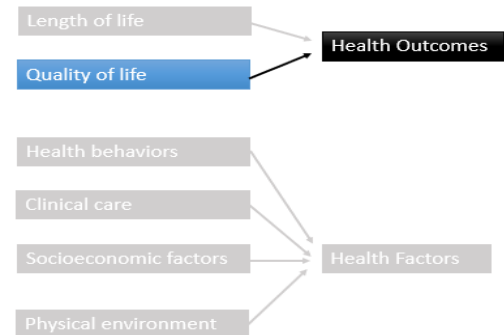
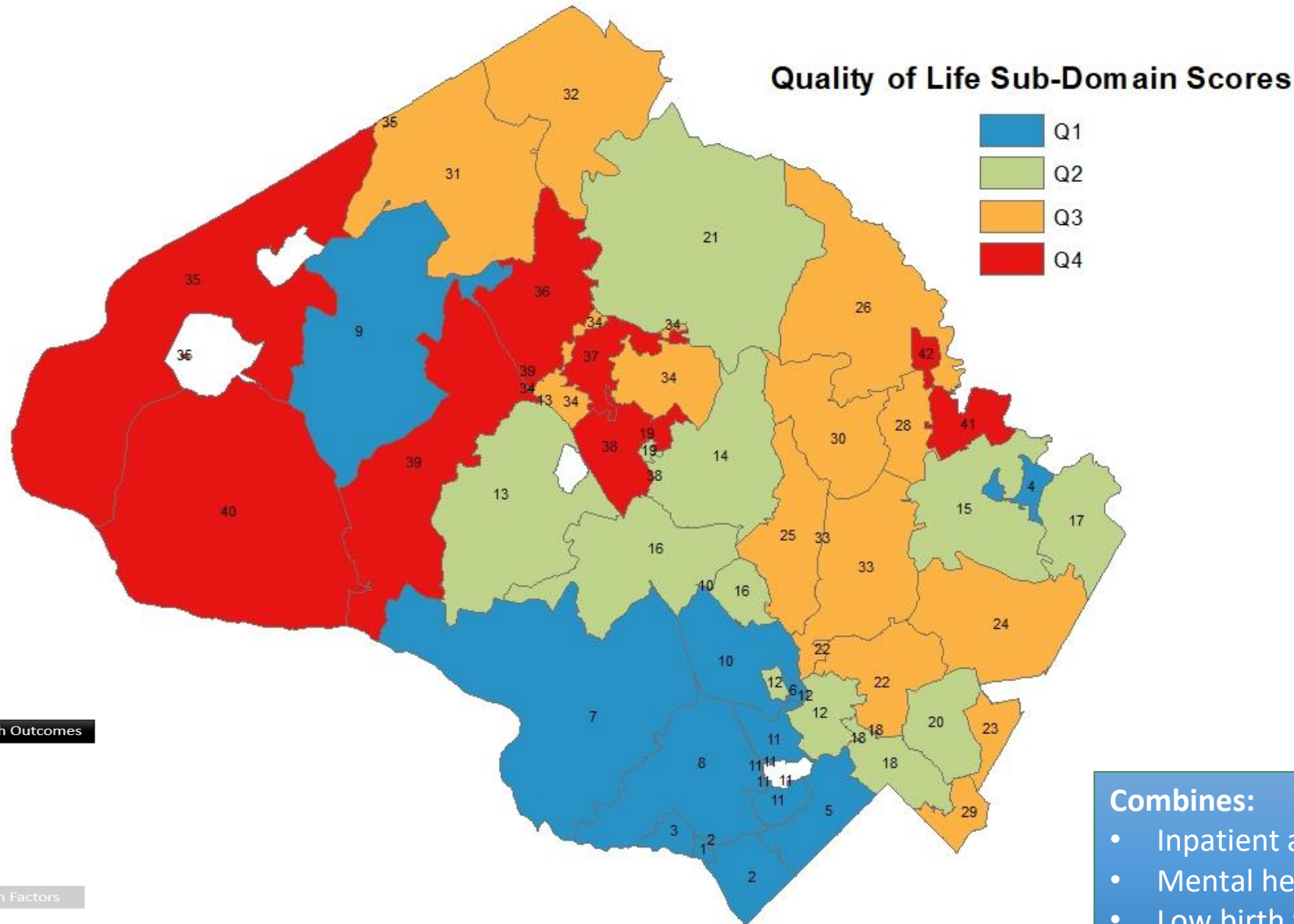
Percent of Live Births with Low Birth Weight (<2,500 g)



# Hospitalizations for Mental Health Conditions per 100,000 People



# Results—Quality of Life



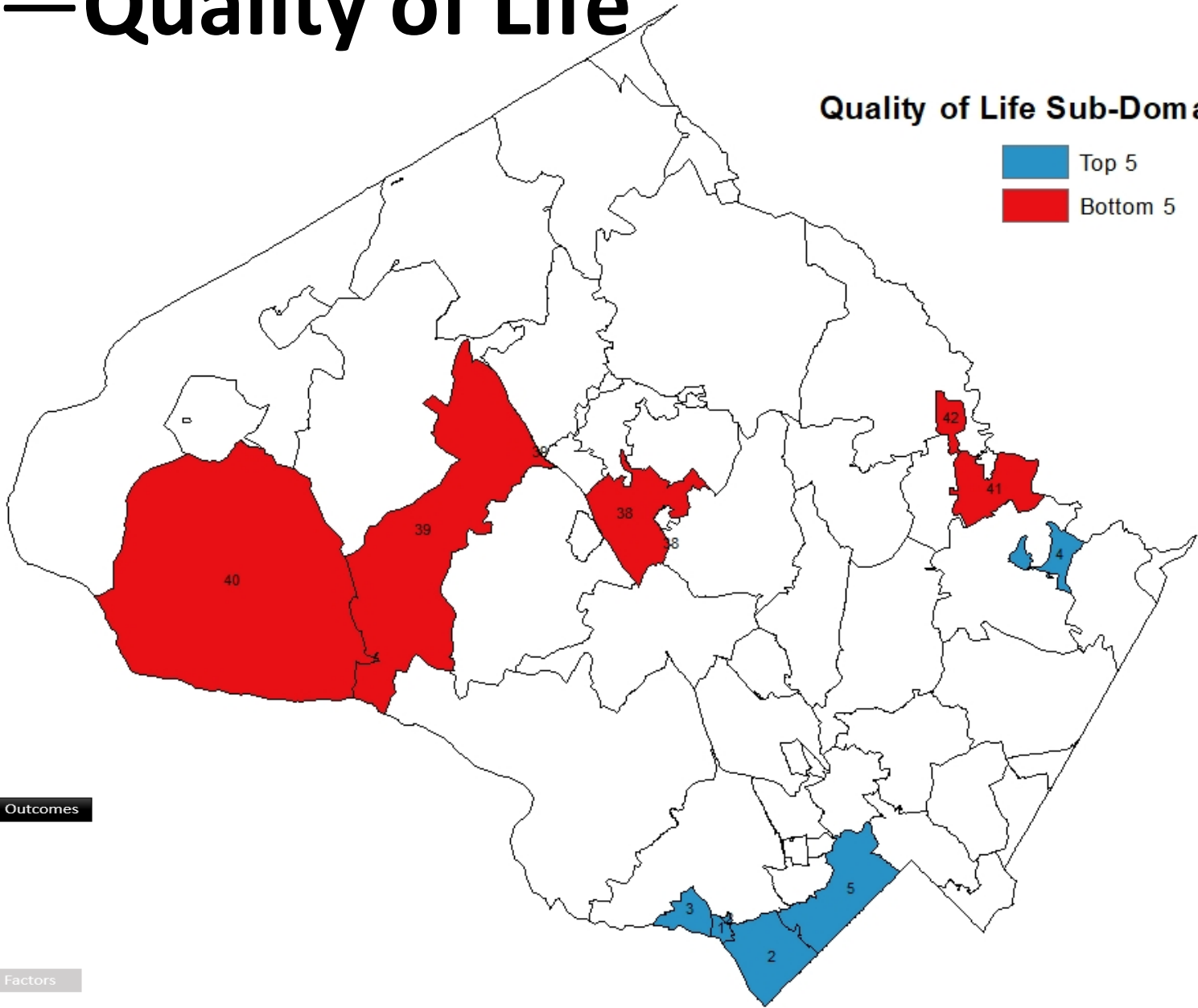
## Combines:

- Inpatient and ER hospitalization rate
- Mental health hospitalization
- Low birth weight



# Results—Quality of Life

Quality of Life Sub-Domain Scores

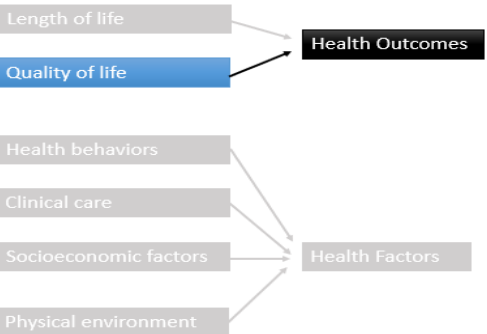


Top 5 Zip Codes

- 1. 20812 - Glen Echo
- 2. 20816 - Bethesda
- 3. 20818 - Cabin John
- 4. 20868 - Spencerville
- 5. 20815 - Chevy Chase

Bottom 5 Zip Codes

- 38. 20877 - Montgomery Village
- 39. 20874 - Darnestown
- 40. 20837 - Poolesville
- 41. 20861 - Ashton
- 42. 20862 - Brinklow



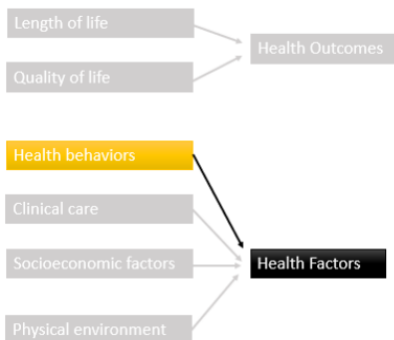
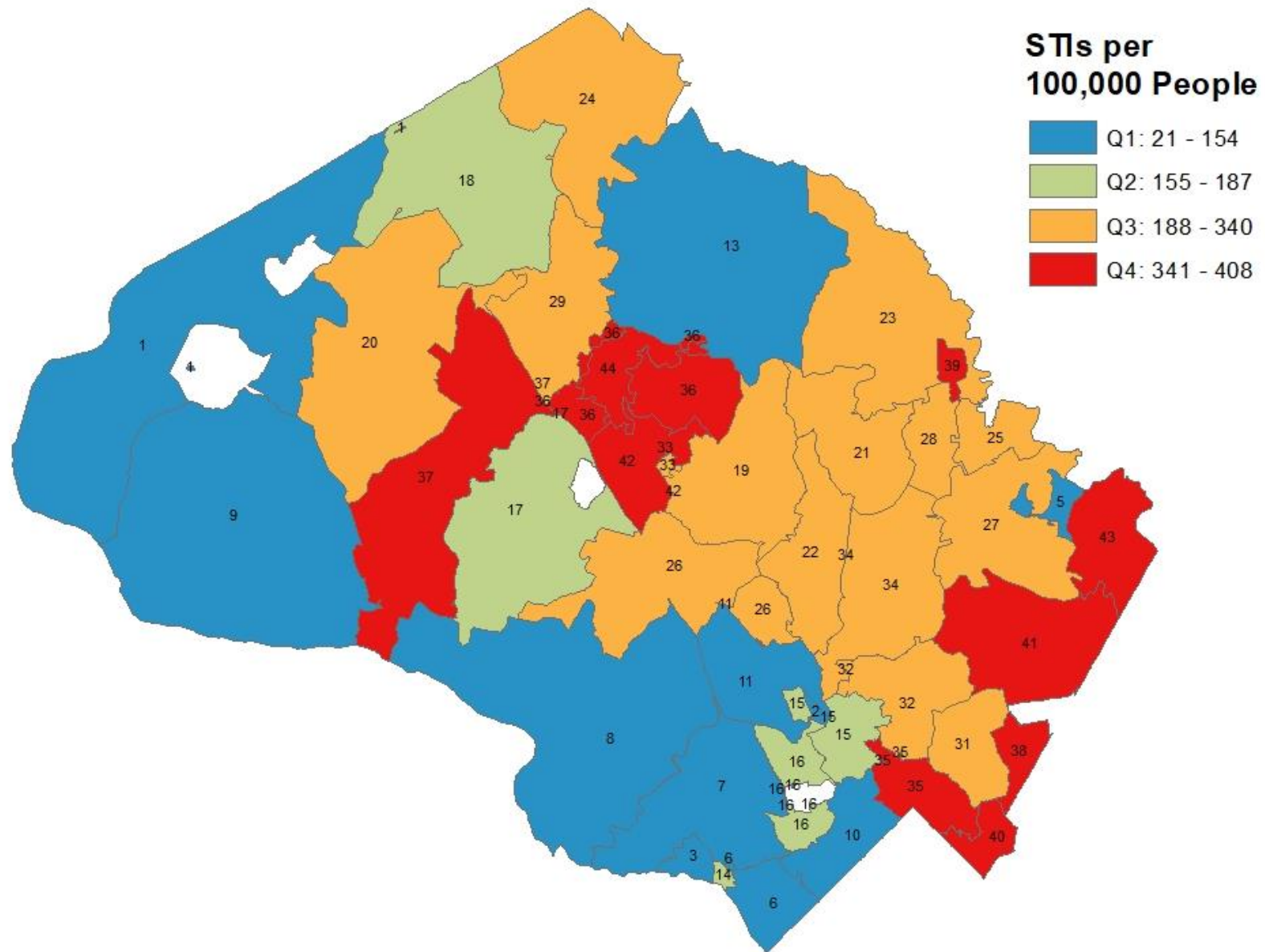
# Health Behaviors

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Components:

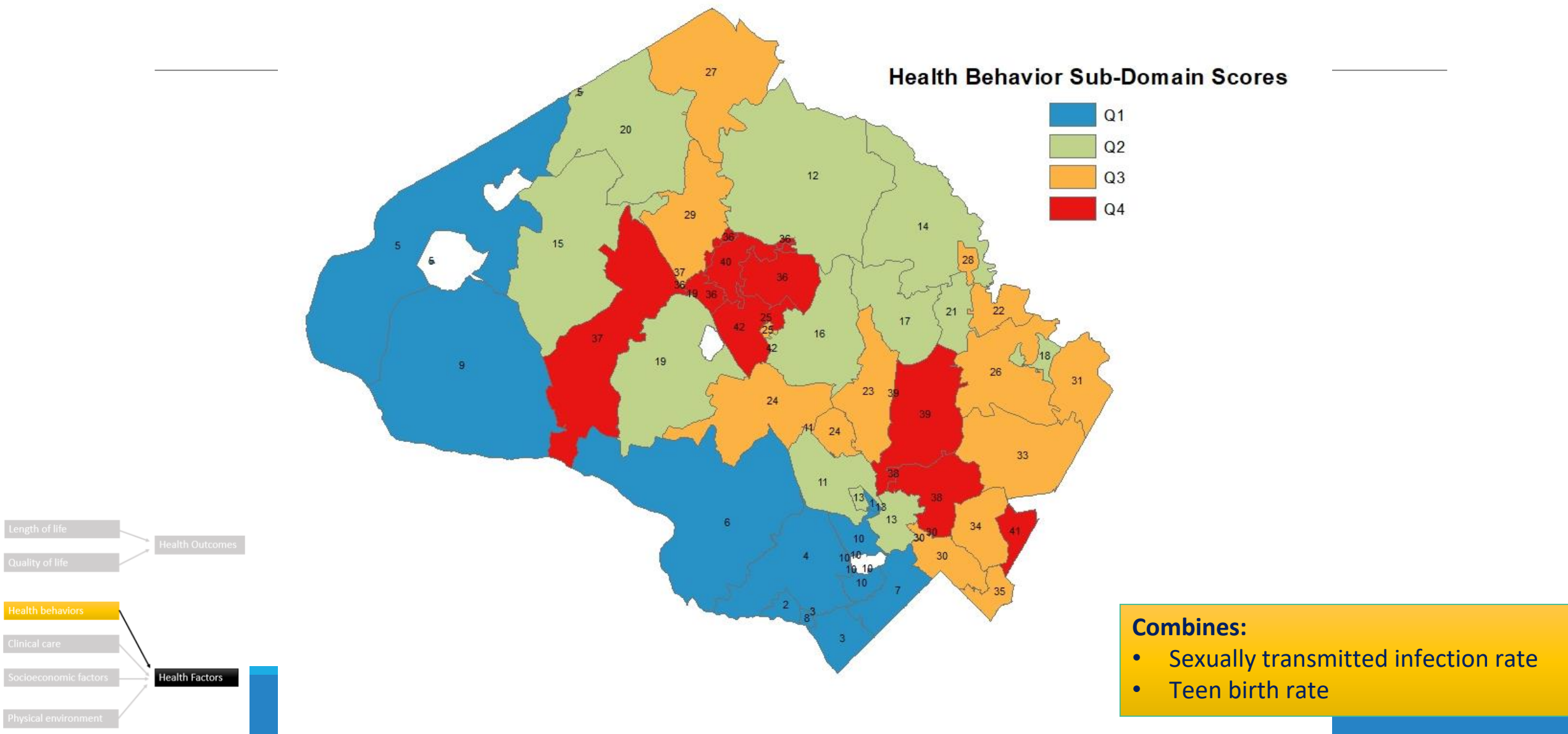
RWJF State Rank: #1

- Sexually transmitted infection rate
- Teen birth rate

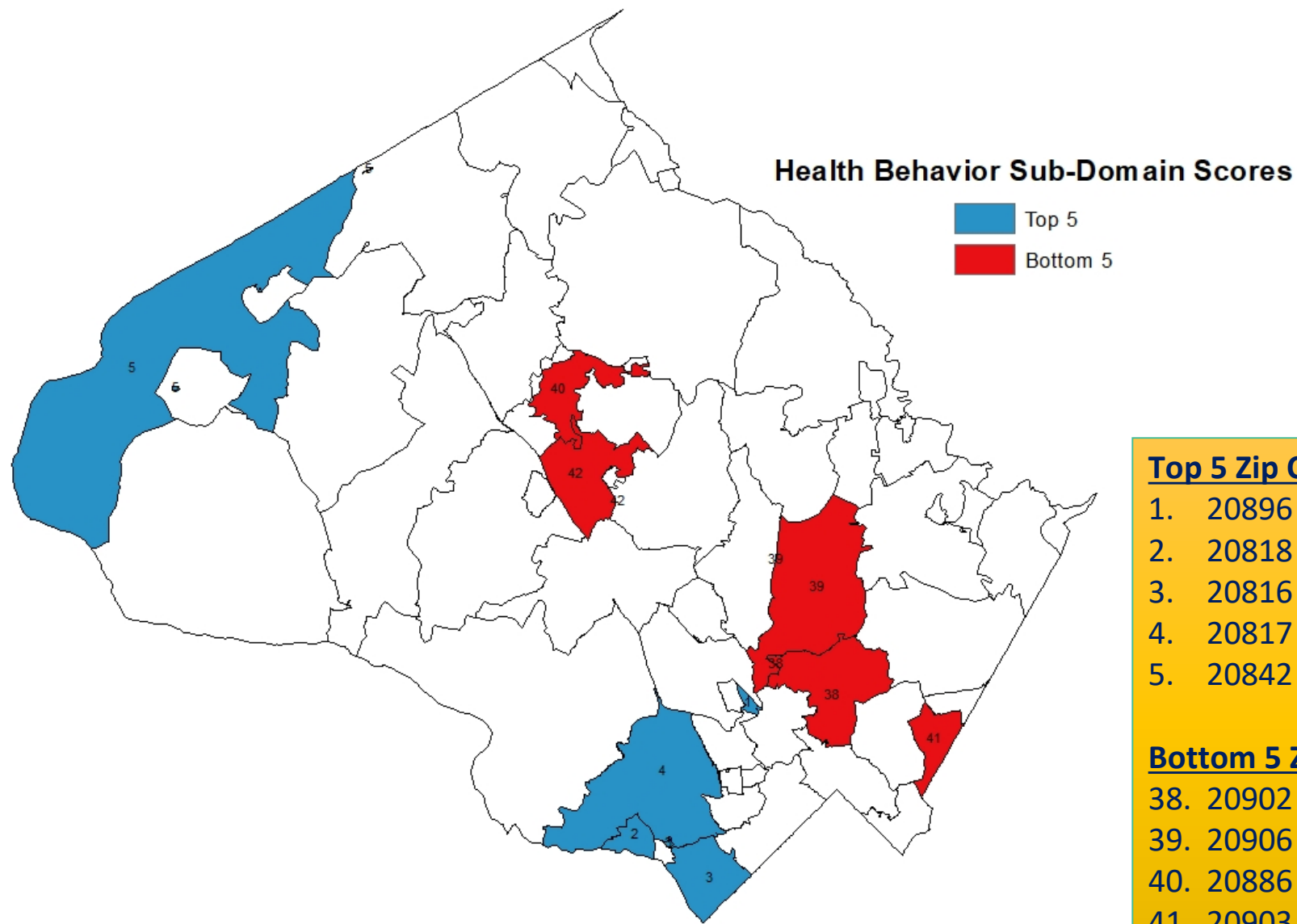




# Results—Health Behaviors



# Results—Health Behaviors

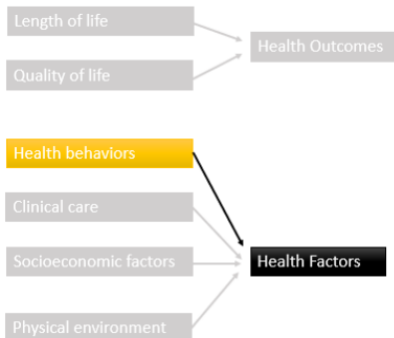


## Top 5 Zip Codes

1. 20896 - Garrett Park
2. 20818 - Cabin John
3. 20816 - Bethesda
4. 20817 - West Bethesda
5. 20842 - Dickerson

## Bottom 5 Zip Codes

38. 20902 - Wheaton/Silver Spring
39. 20906 - Aspen Hill
40. 20886 - Gaithersburg
41. 20903 - Silver Spring
42. 20877 - Montgomery Village



# Clinical Care Factors

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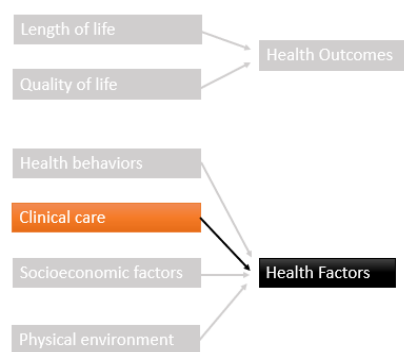
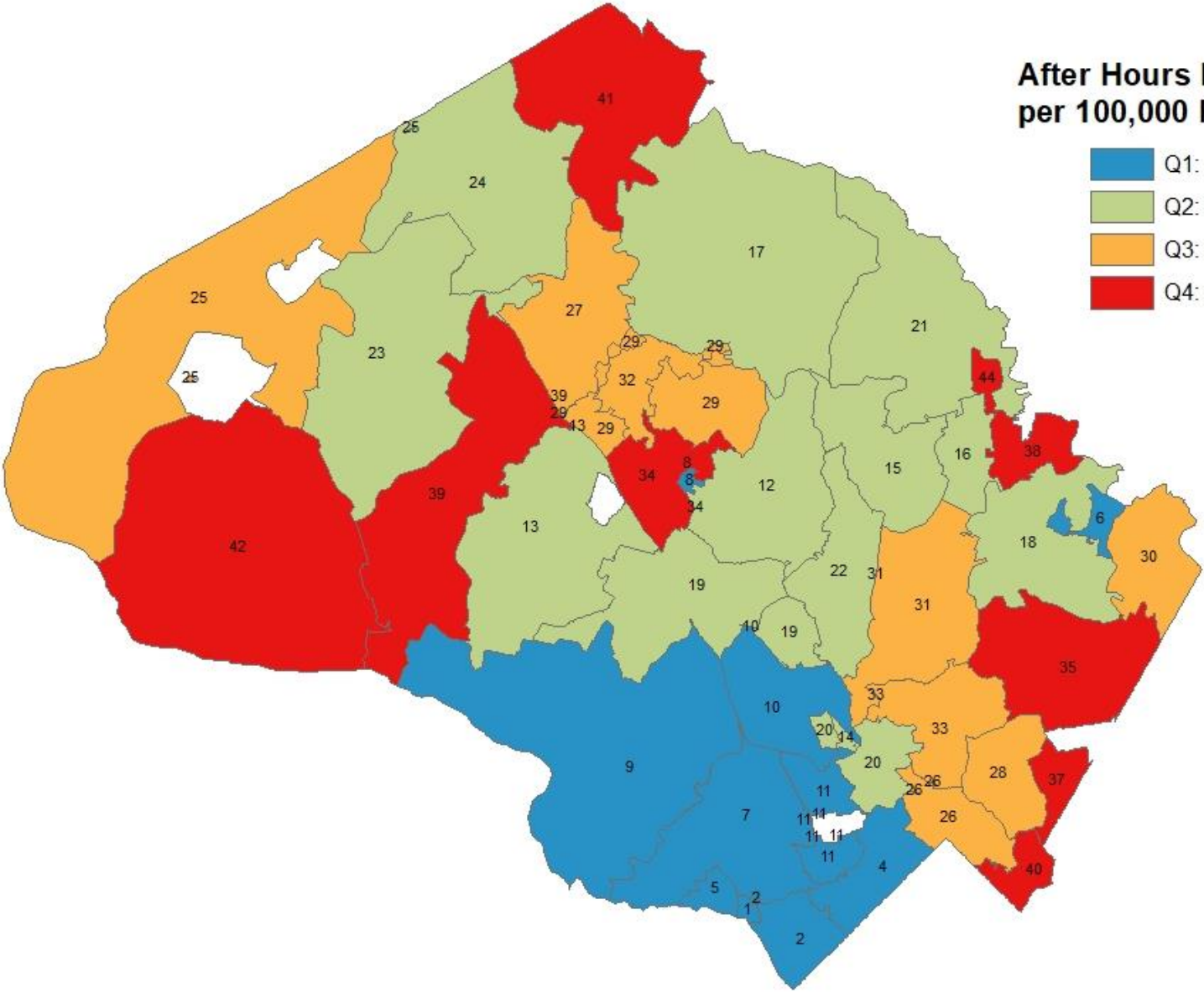
Components:

RWJF State Rank: #2

- Percent of population employed in healthcare
- After hours emergency department visits
- Hospitalizations for preventable conditions (PQI score)

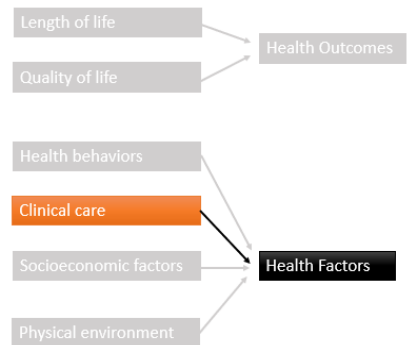
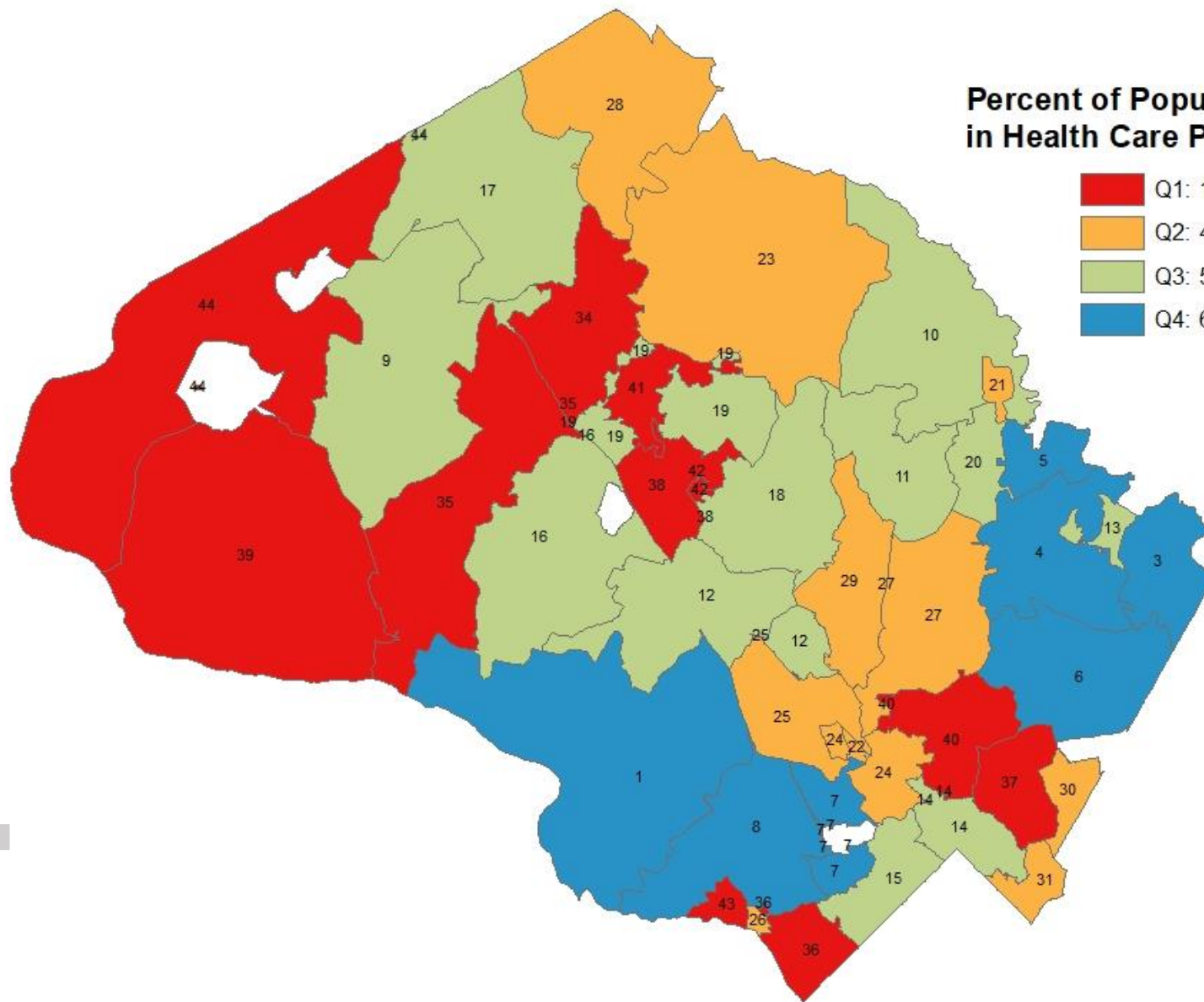
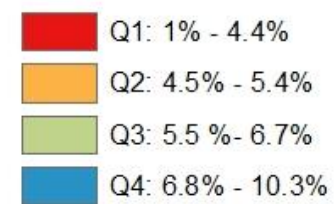


After Hours Hospital Visits  
per 100,000 People

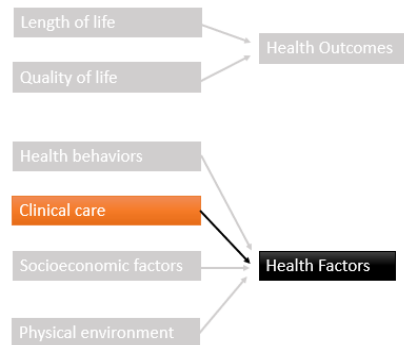
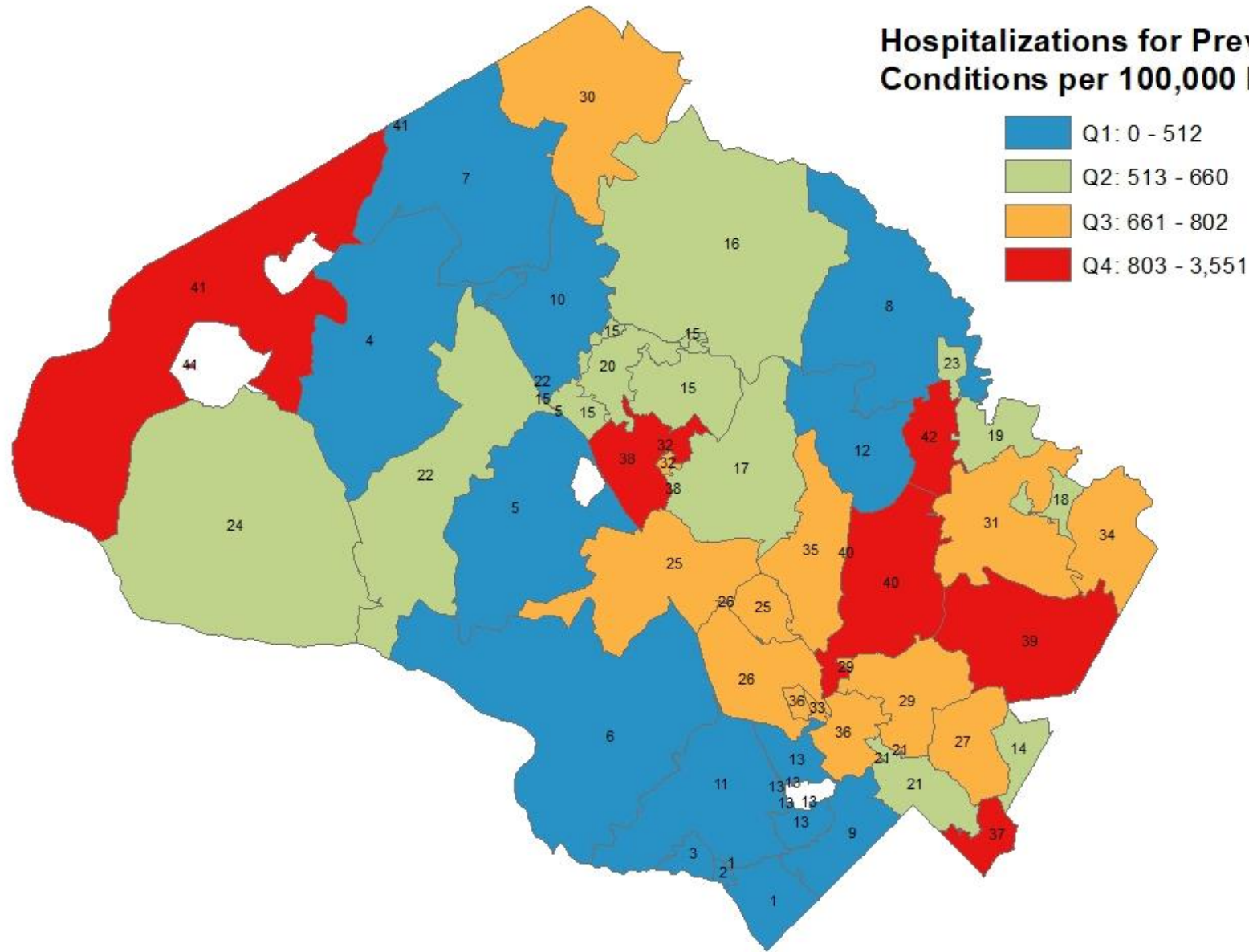




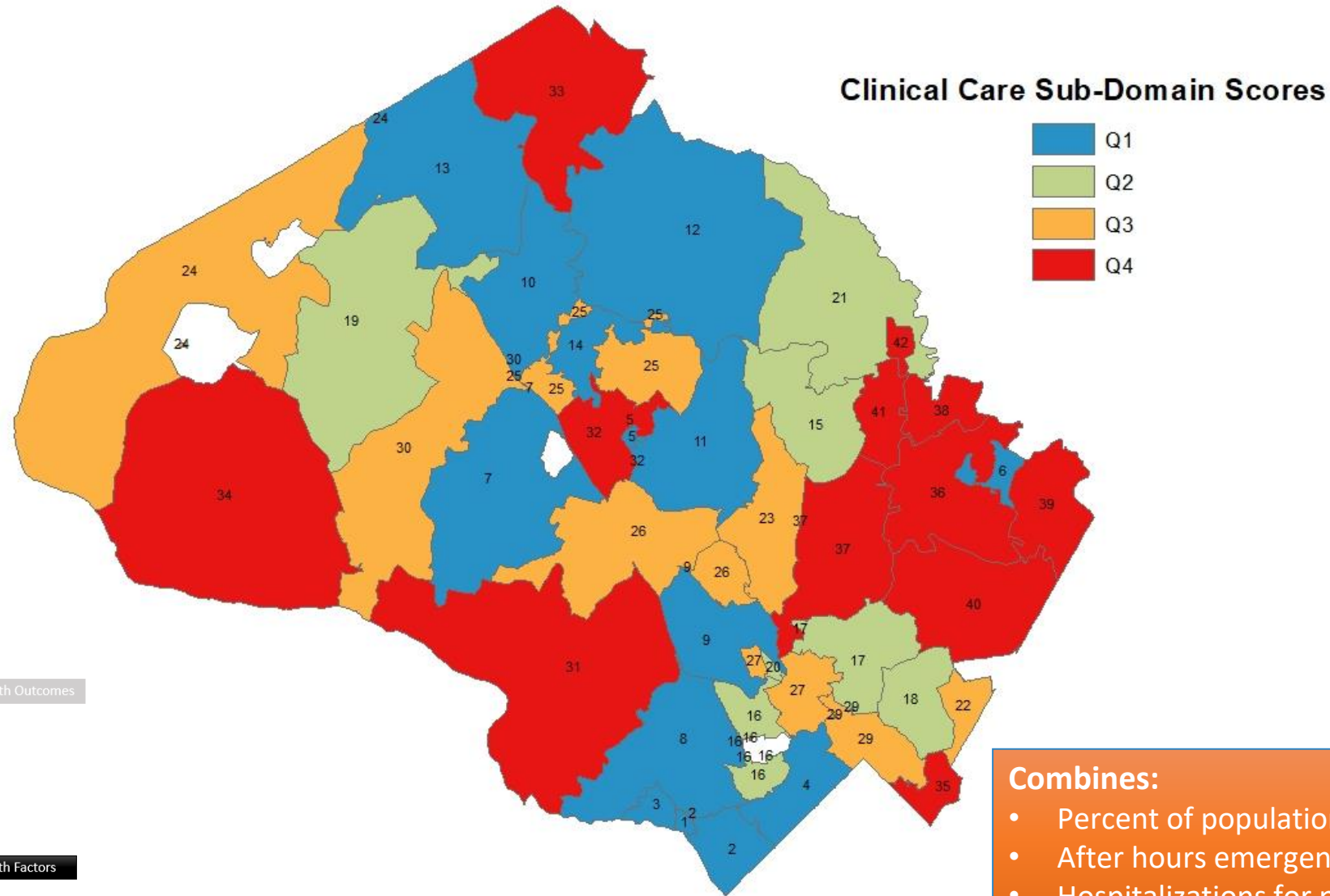
## Percent of Population Employed in Health Care Profession



### Hospitalizations for Preventable Conditions per 100,000 People



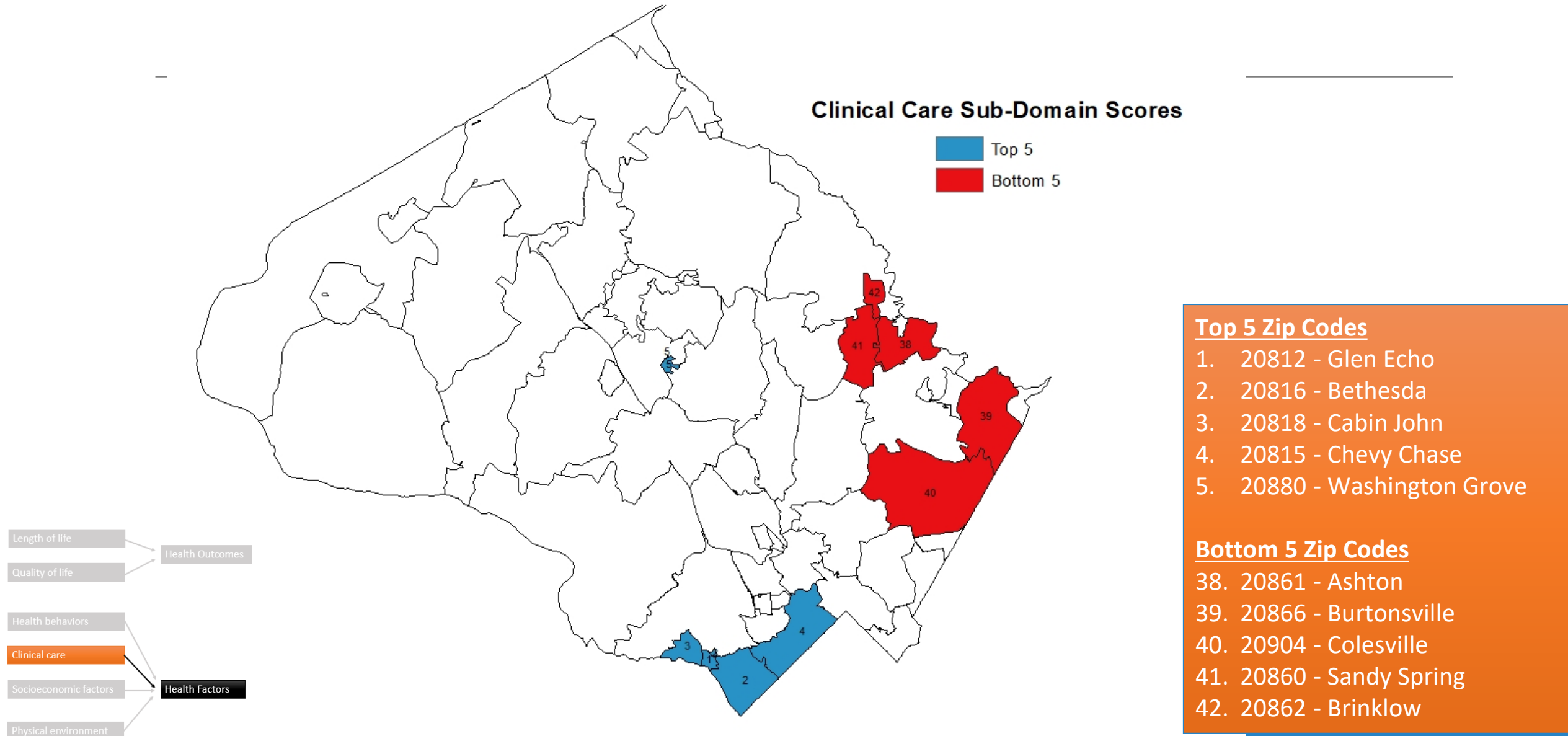
# Results—Clinical Care Factors



## Combines:

- Percent of population employed in healthcare
- After hours emergency department visits
- Hospitalizations for preventable conditions (PQI score)

# Results—Clinical Care Factors



# Socio-economic Factors

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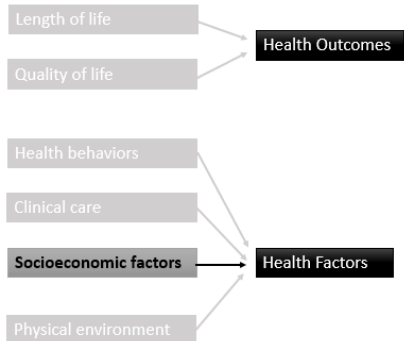
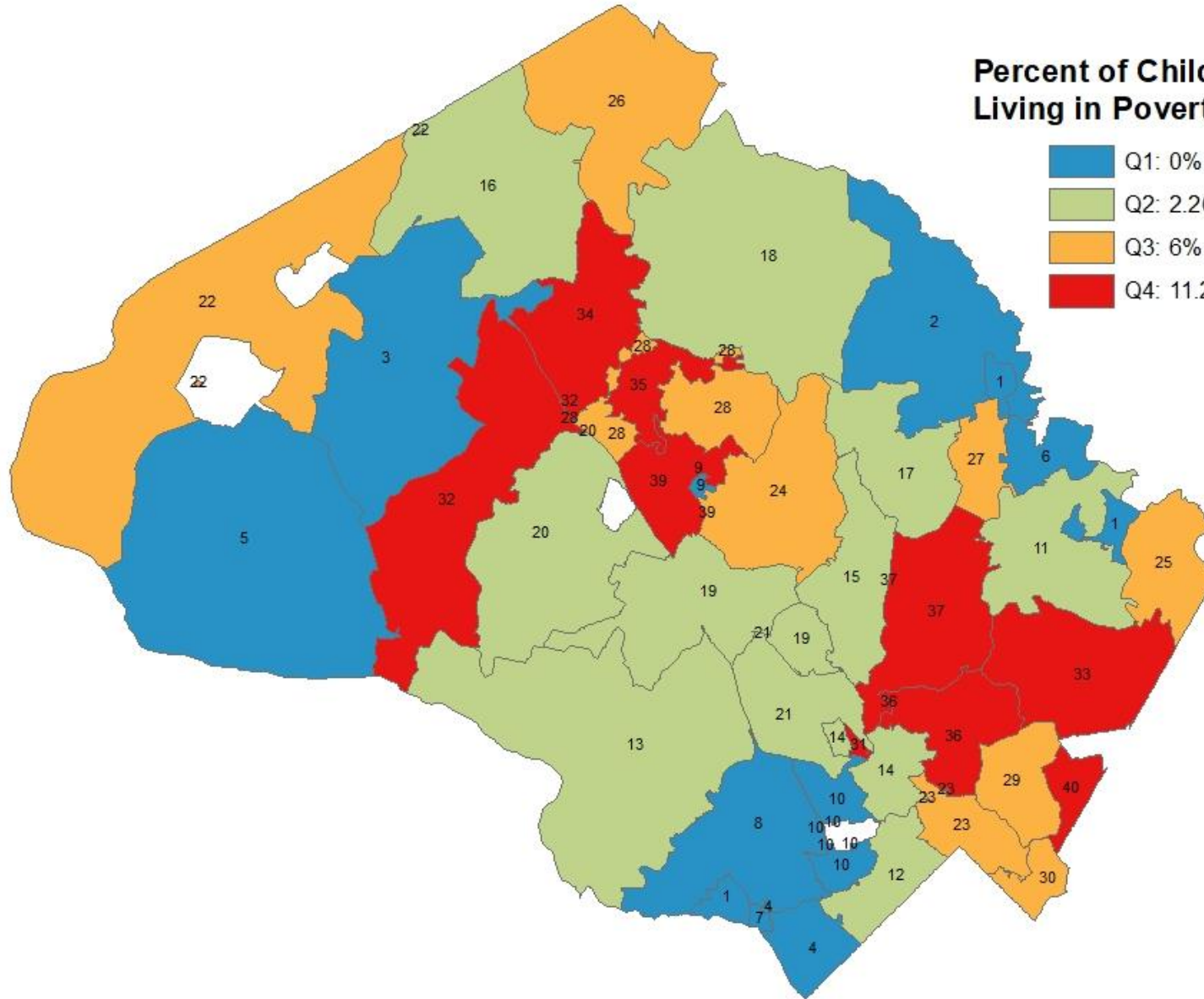
Components:

RWJF State Rank: #4

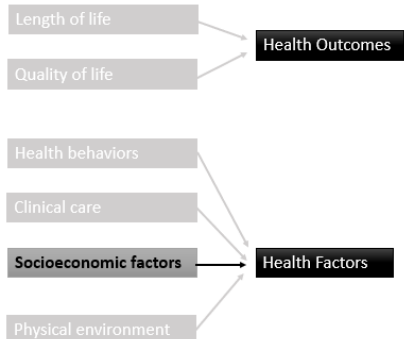
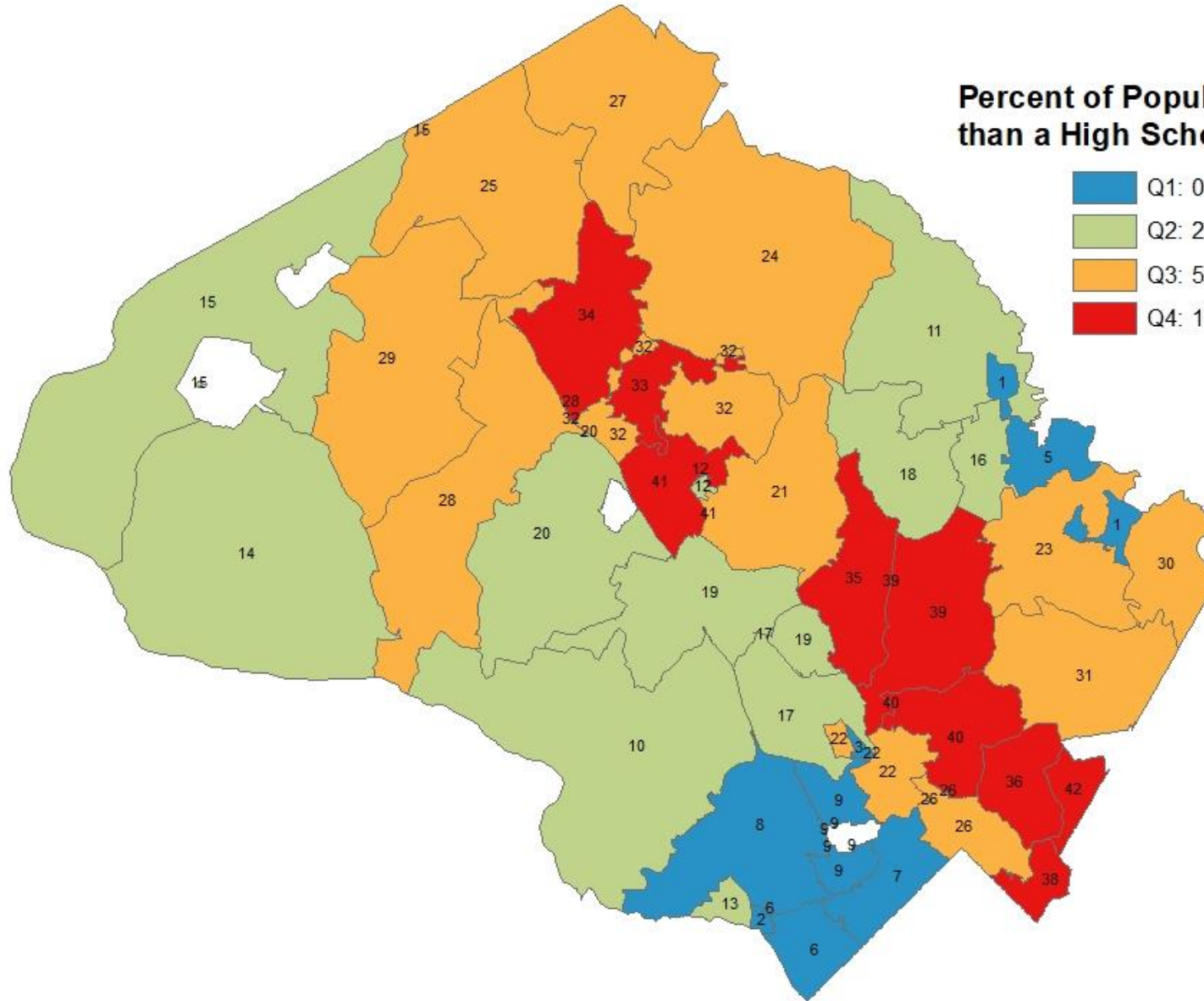
- Population with less than a HS education
- Unemployment rate
- Childhood poverty rate
- Median household income



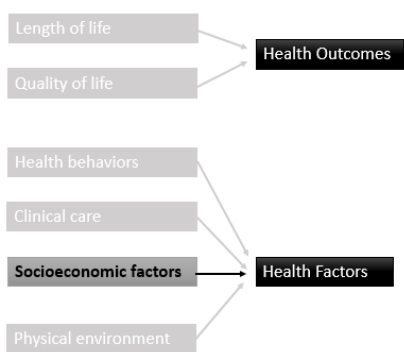
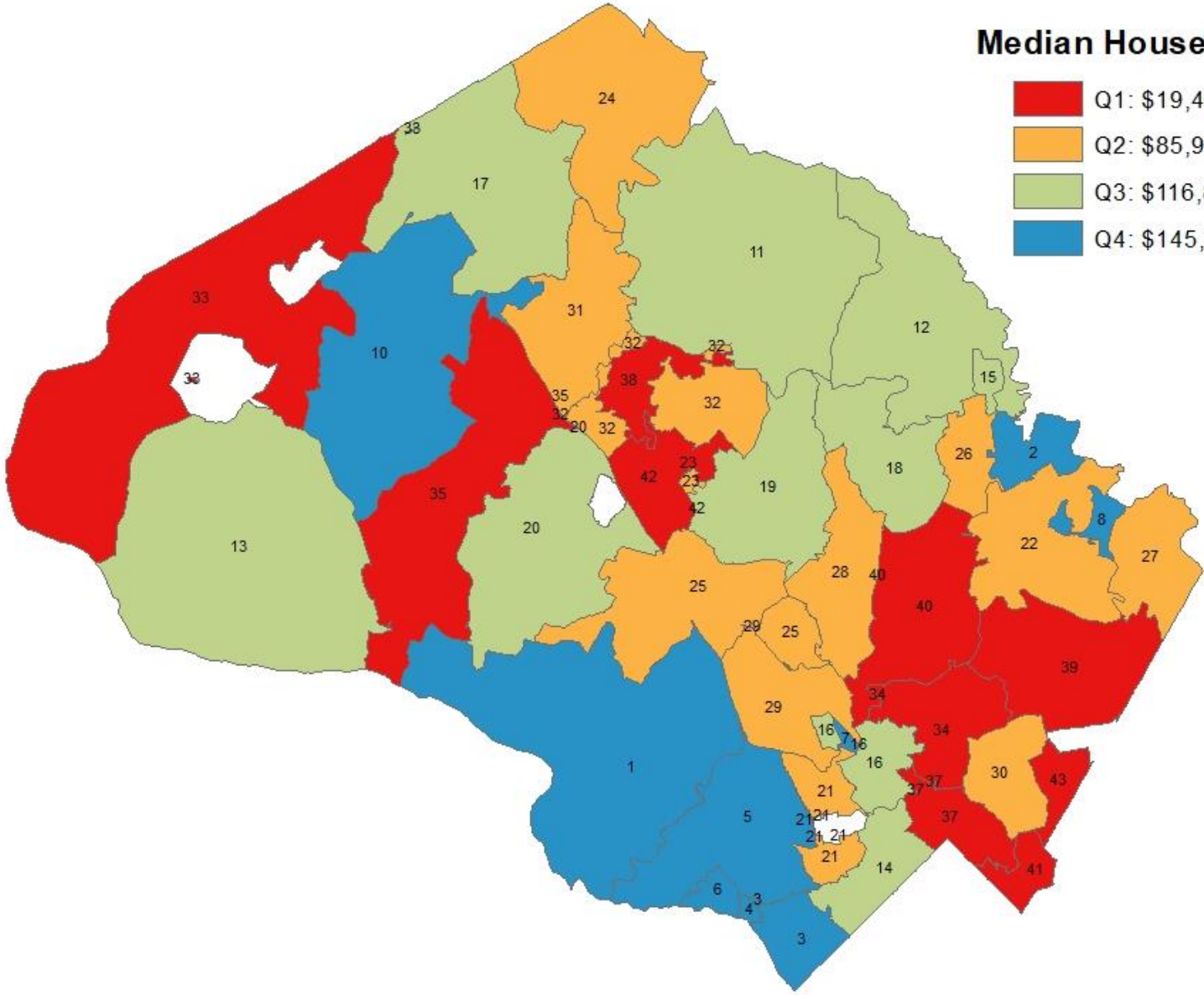
## Percent of Children Under 18 Living in Poverty



## Percent of Population with Less than a High School Diploma

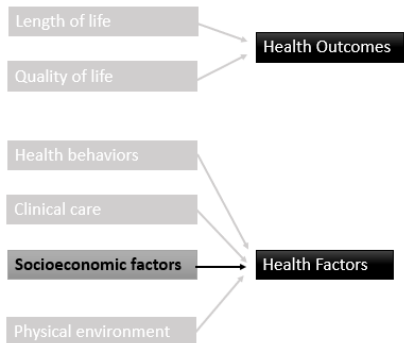
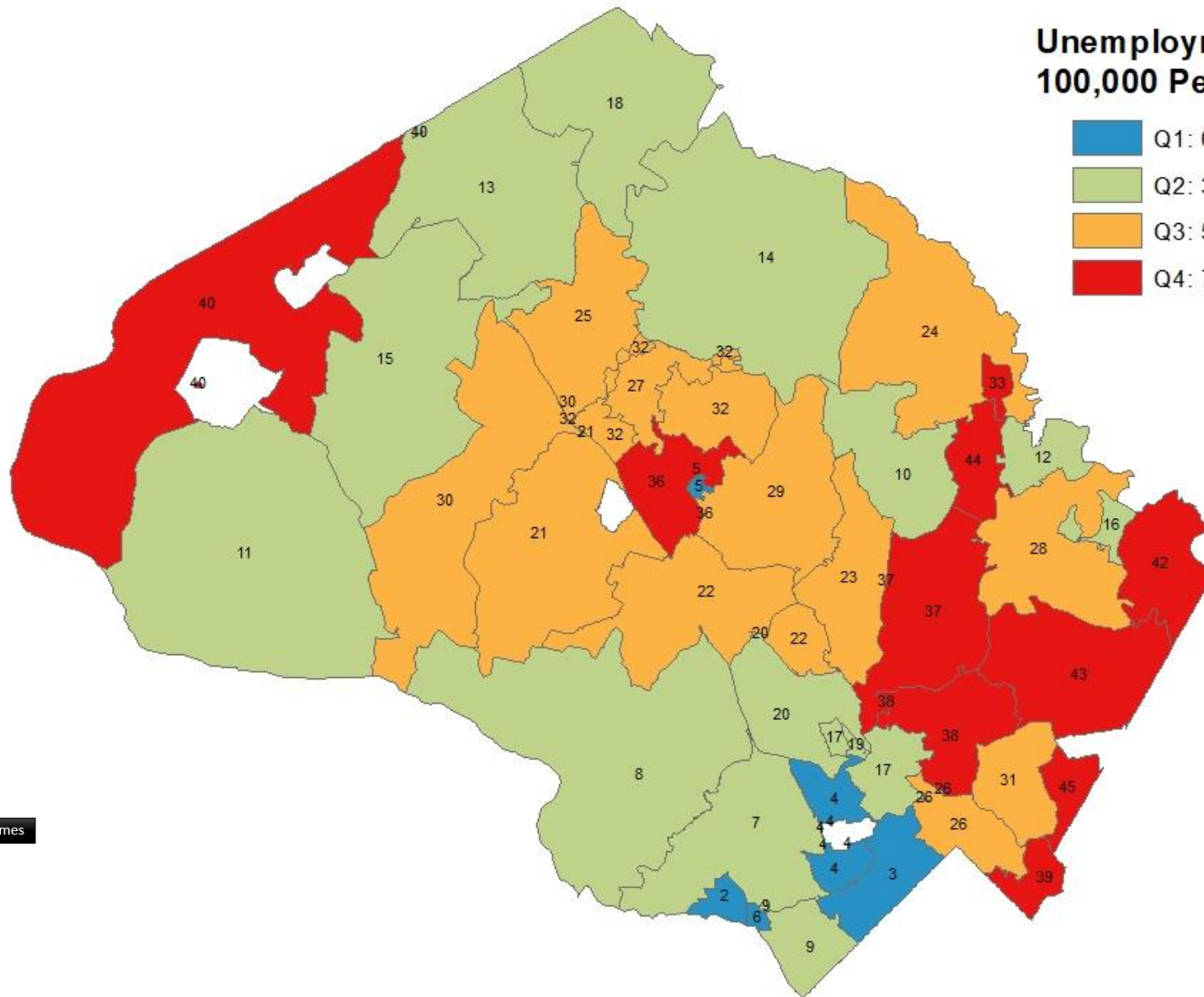


**Median Household Income**

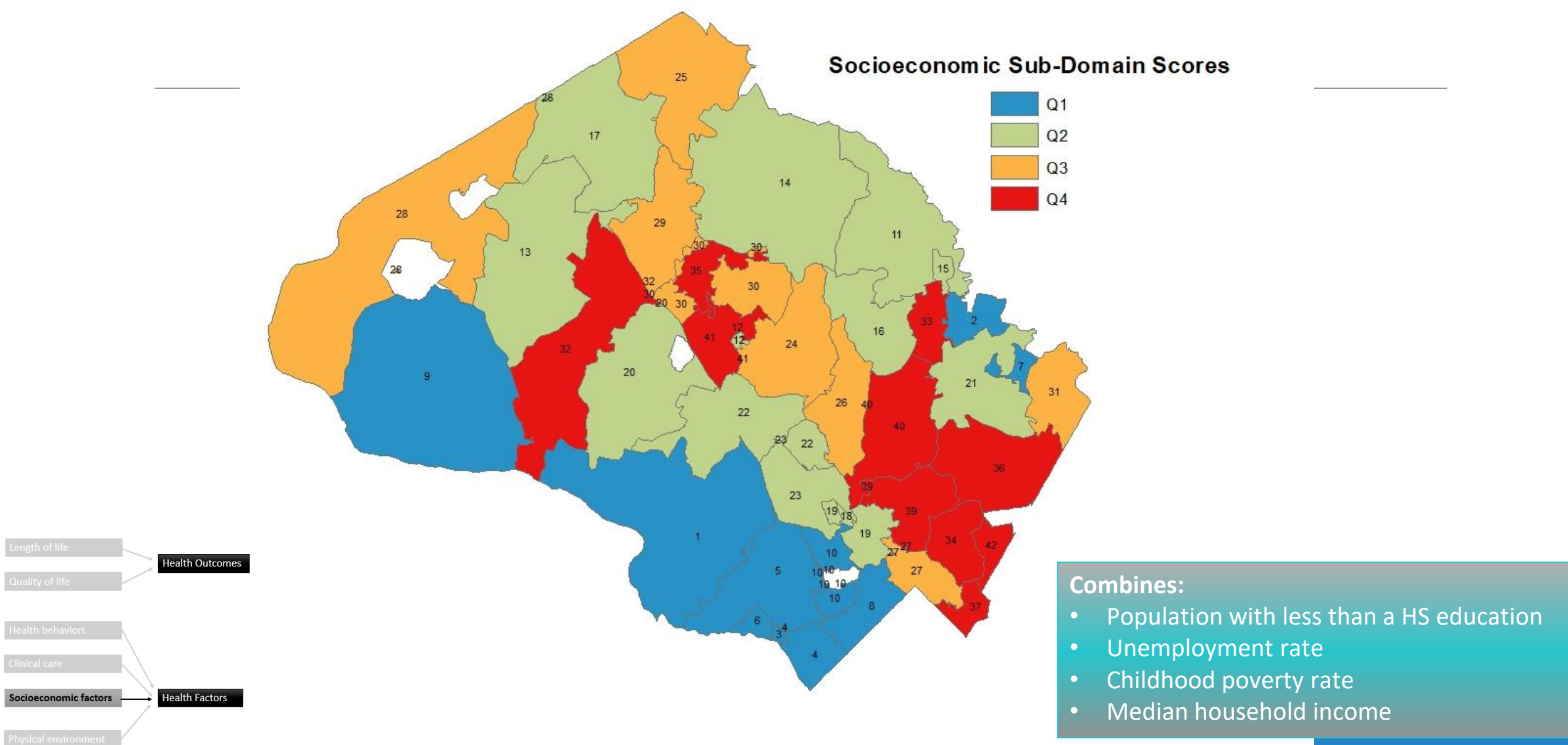




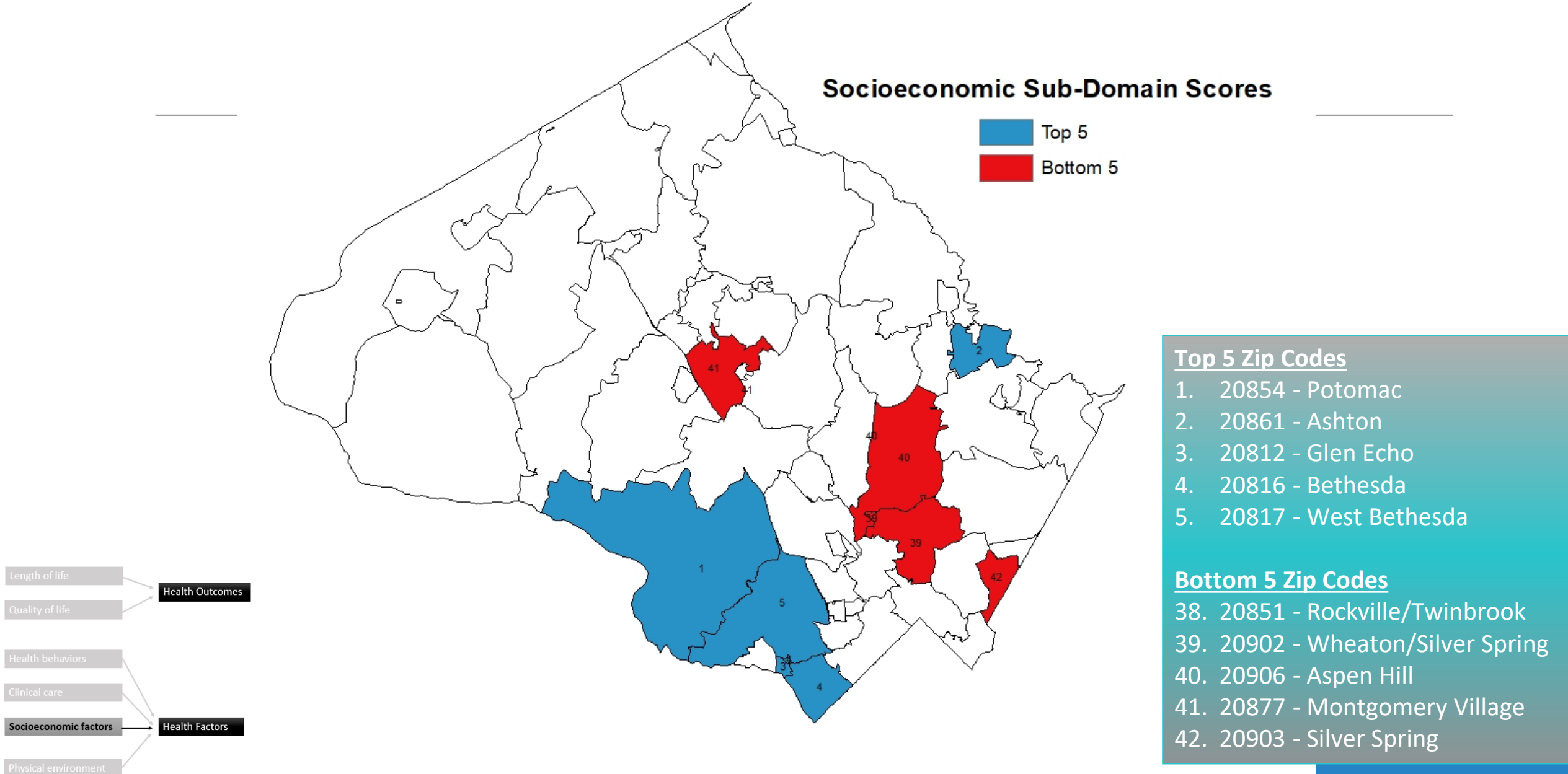
## Unemployment per 100,000 People



# Results—Socioeconomic Factors



# Results—Socioeconomic Factors



# Physical Environment

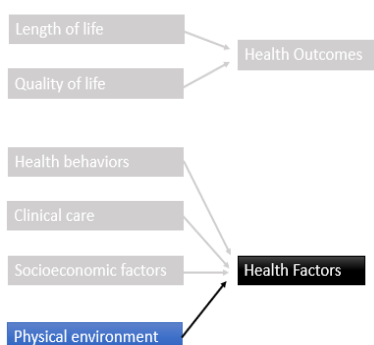
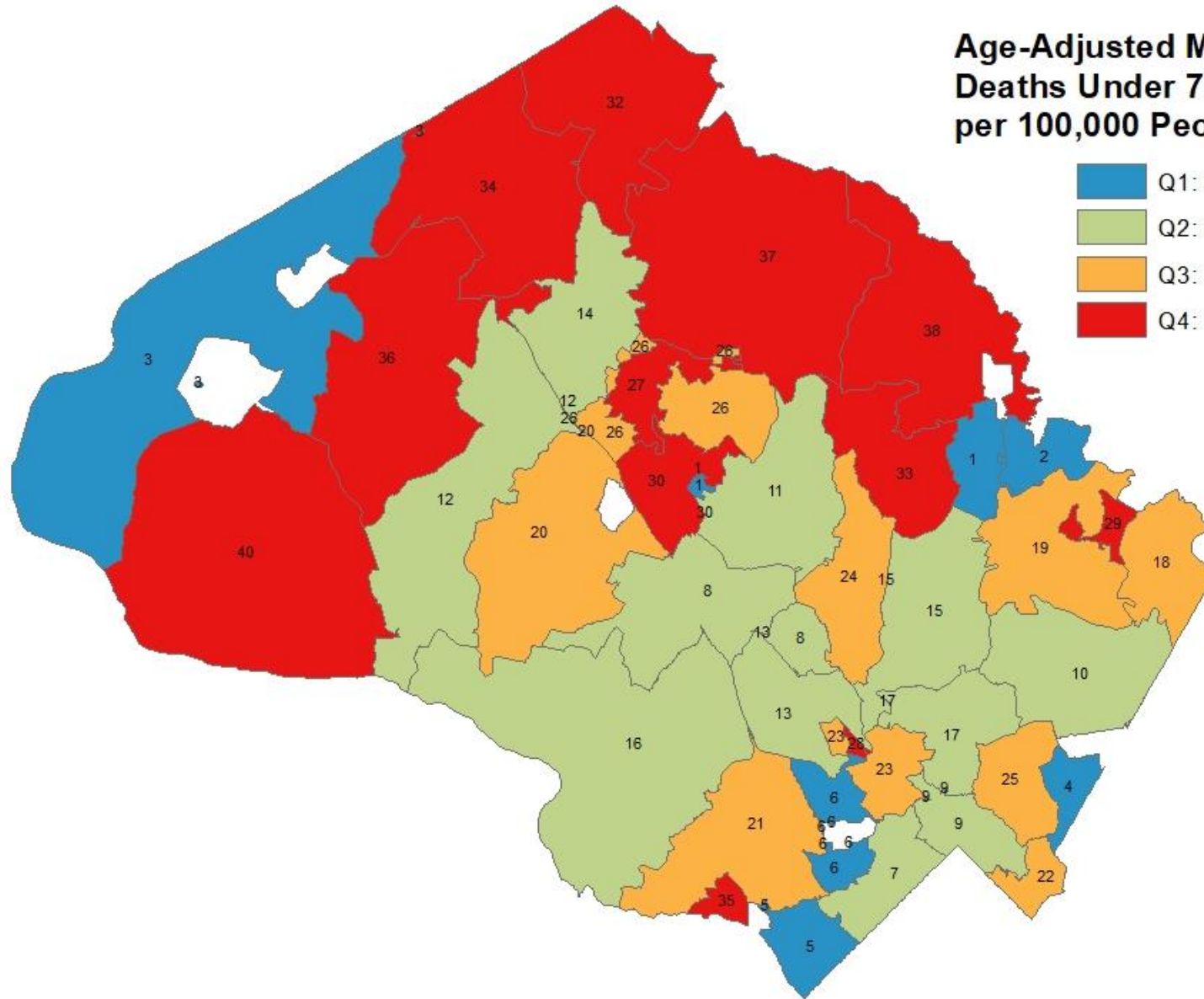
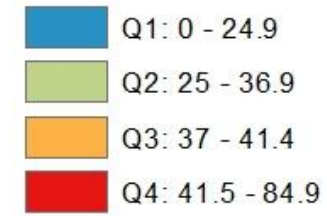
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Components:

- Violent crime rate
- Injury death rate

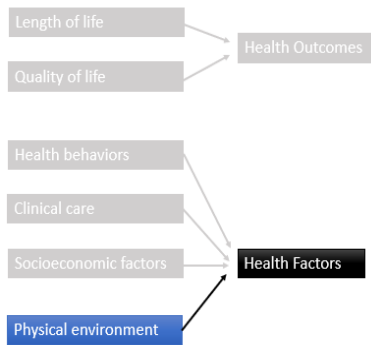
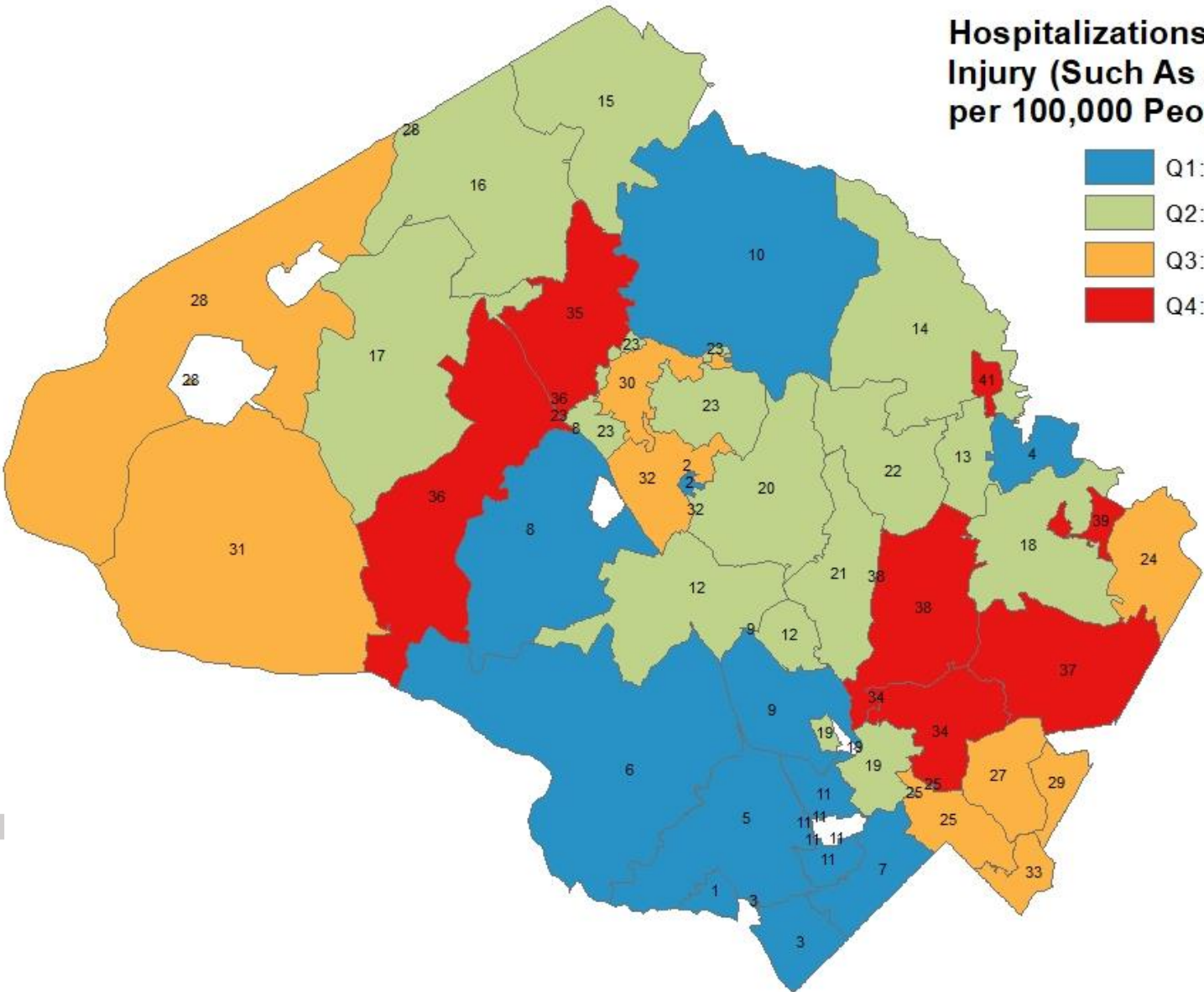
RWJF State Rank: #7

# Age-Adjusted Mortality: Deaths Under 75 Due To Injury per 100,000 People

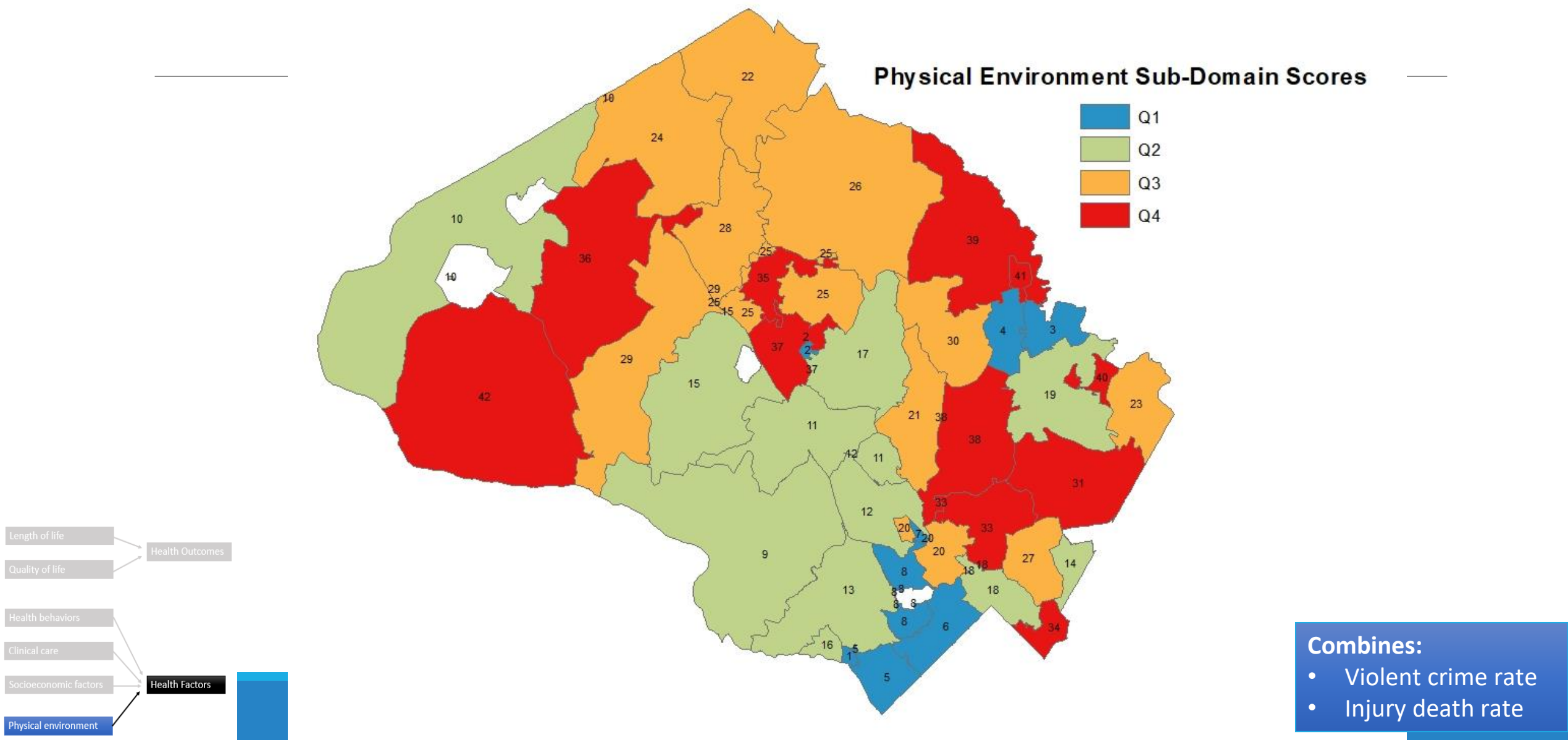




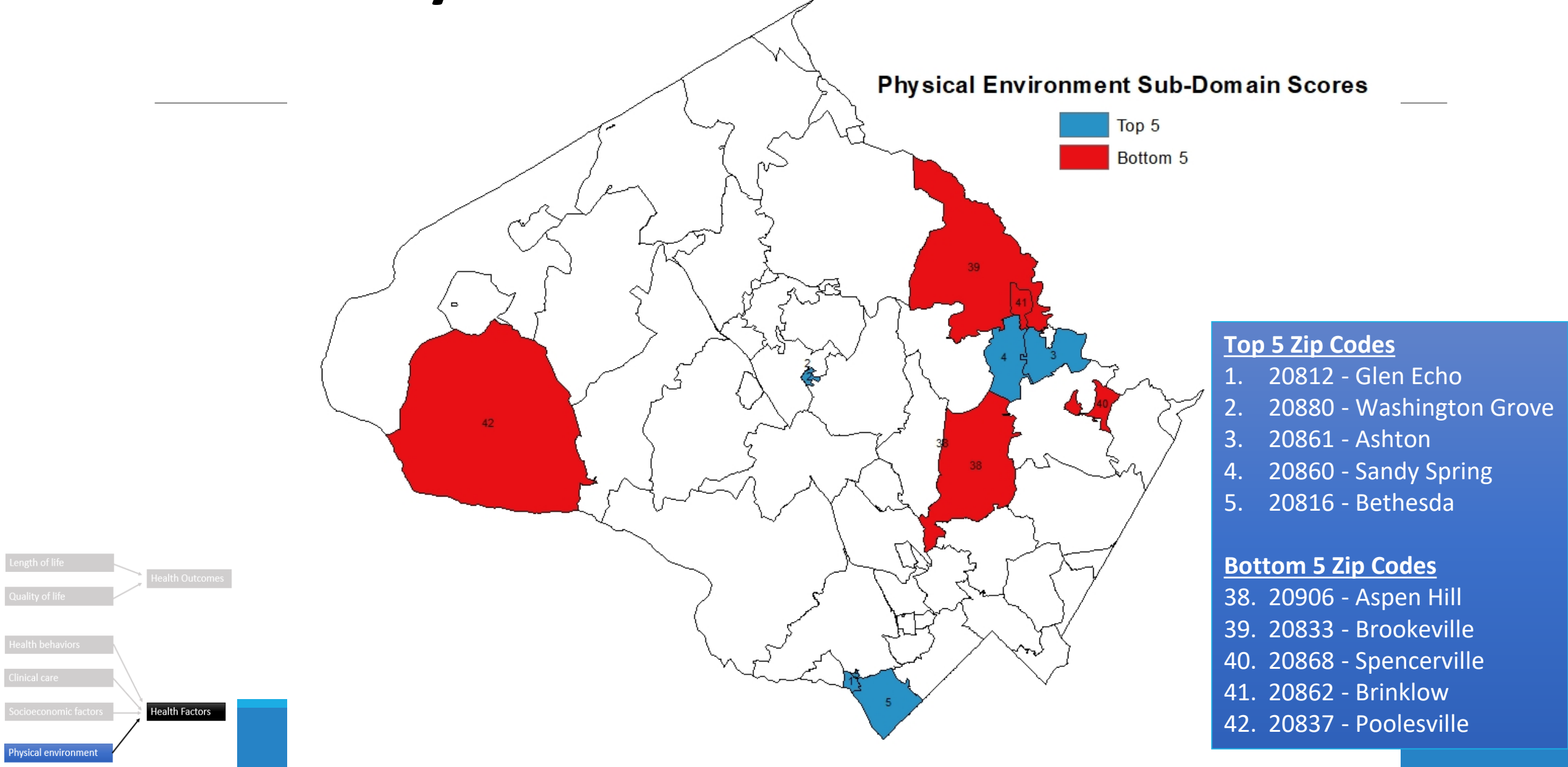
# Hospitalizations Due to Violent Injury (Such As Assault) per 100,000 People



# Results—Physical Environment



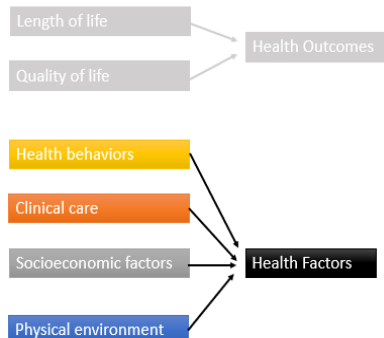
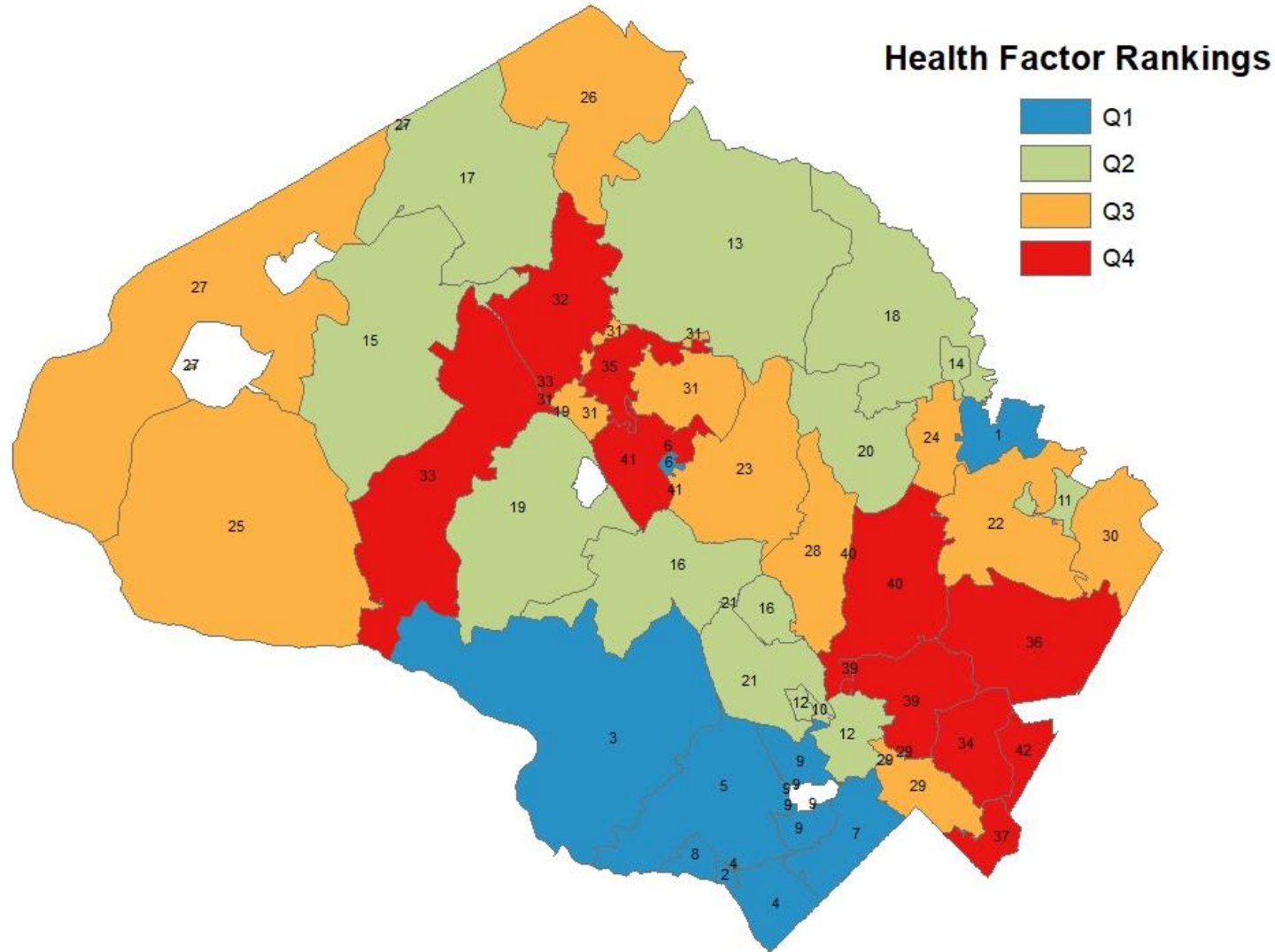
# Results—Physical Environment





# Domain Scores and Overall Rank

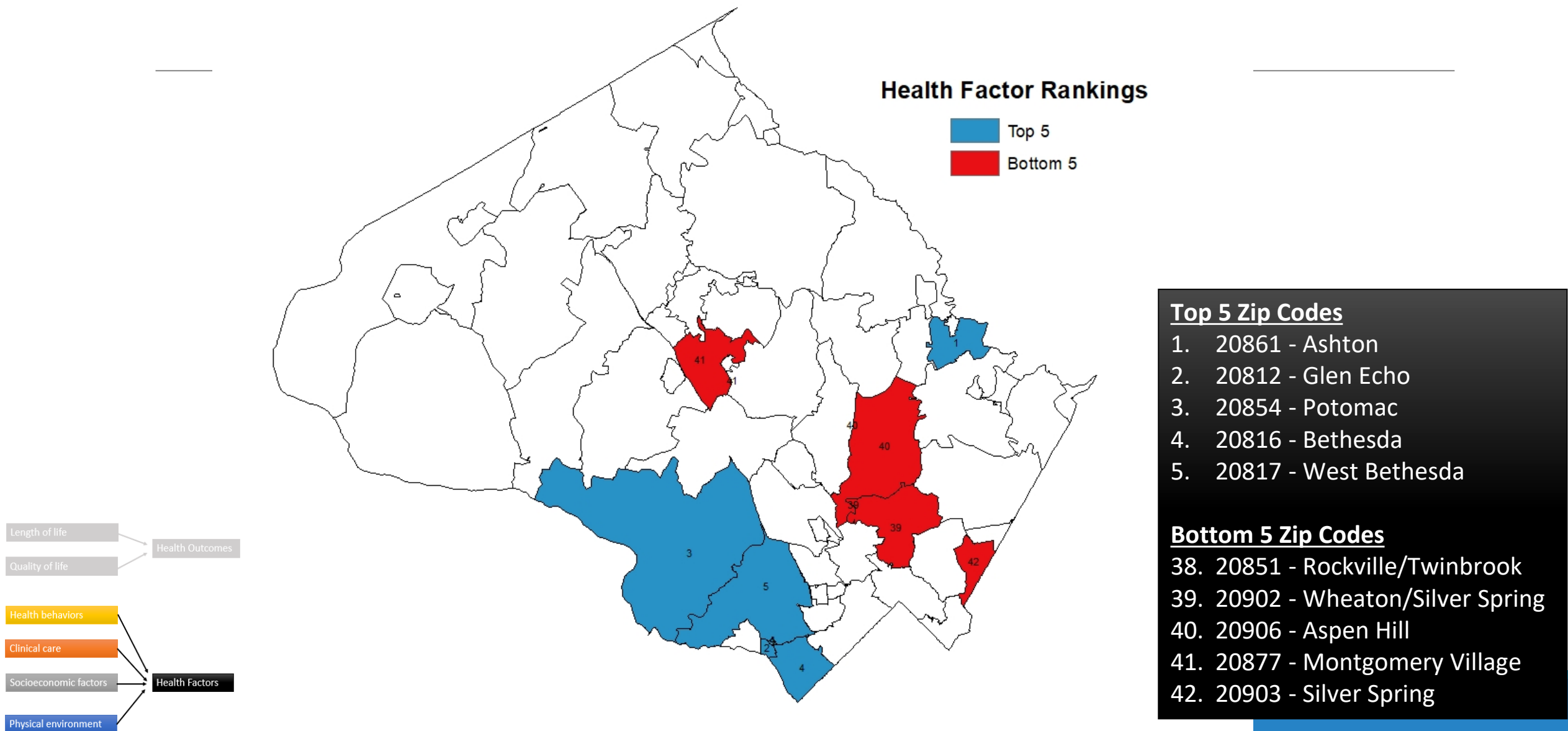
# Results—Health Factor Domain Scores



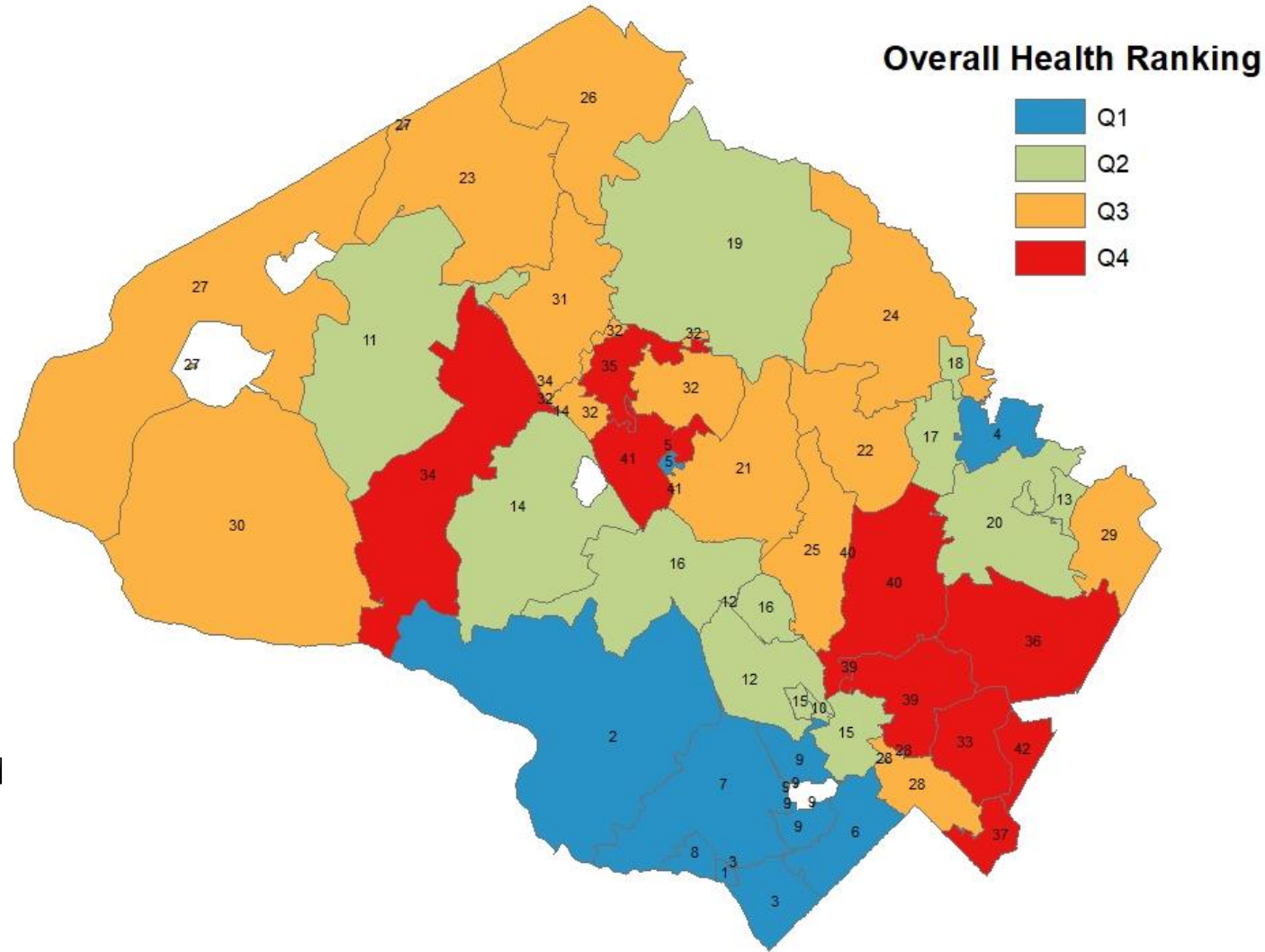
## Combines 4 sub-domains:

- Health Behaviors
- Clinical Care
- Socioeconomic Factors
- Physical Environments

# Results—Health Factor Domain Scores

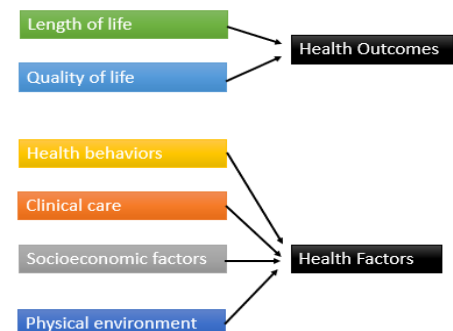


# Results—Overall Rank

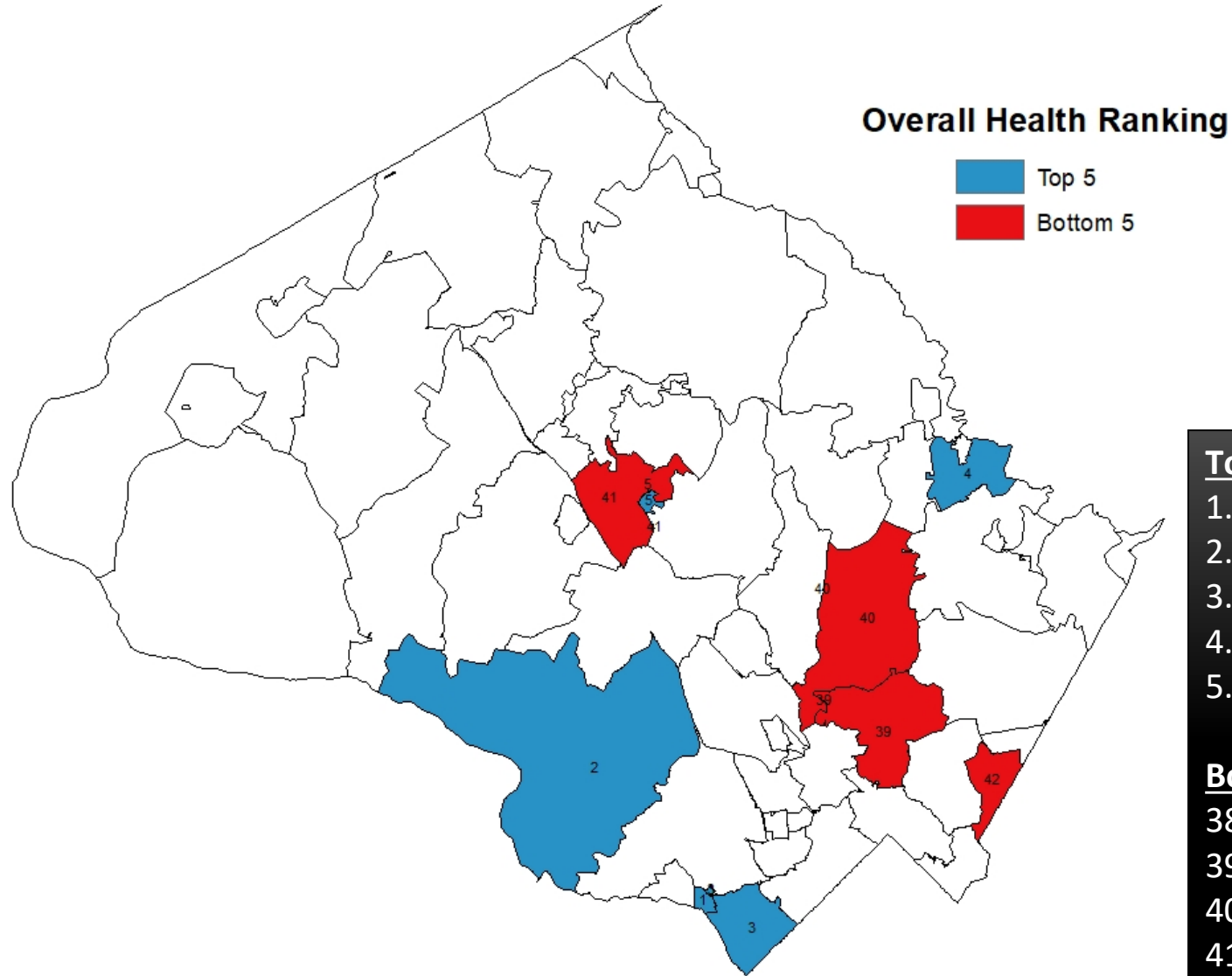


## Combines all 6 sub-domains:

- Length of Life
- Quality of Life
- Health Behaviors
- Clinical Care
- Socioeconomic Factors
- Physical Environments



# Results—Overall Rank



## Top 5 Zip Codes

1. 20812 - Glen Echo
2. 20854 - Potomac
3. 20816 - Bethesda
4. 20861 - Ashton
5. 20880 - Washington Grove

## Bottom 5 Zip Codes

38. 20851 - Rockville/Twinbrook
39. 20902 - Wheaton/Silver Spring
40. 20906 - Aspen Hill
41. 20877 - Montgomery Village
42. 20903 - Silver Spring

